R E P O R T R E S U M E S

ED 003 260 24

VALIDATION OF THE MINNESOTA VOCATIONAL INTEREST INVENTORY FOR VOCATIONAL HIGH SCHOOL BOYS, PART 1.

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REPORT NUMBER CRP-1350-PT-1 PUB DATE 1 JUL 63
EDRS PRICE MF-$0.18 HC-$2.68 67P.

DESCRIPTORS- *TEST VALIDITY, *VOCATIONAL EDUCATION, *VOCATIONAL HIGH SCHOOL, *VOCATIONAL INTERESTS, *ETHNIC GROUPS, TEST INTERPRETATION, GRADE 9, GRADE 12, HIGH SCHOOL STUDENTS, MALE, VOCATIONAL COUNSELING, BUFFALO, NEW YORK, MINNESOTA VOCATIONAL INTEREST INVENTORY (MVII)

AN INVESTIGATION WAS MADE OF THE MINNESOTA VOCATIONAL INTEREST INVENTORY (MVII) PATTERNS AND VOCATIONAL ENROLLMENT TO AID IN THE SELECTION AND COUNSELING OF STUDENTS. OVER 1,000 HIGH SCHOOL BOYS IN THE 9TH AND 12TH GRADES WERE TESTED. A VARIETY OF VARIABLES WERE TESTED INCLUDING ETHNIC DISTRIBUTION. THE MVII WAS FOUND VALID IN SOME AREAS AND LACKING IN OTHERS. THE SUGGESTED CHANGES FOR THE MVII ARE TO LOWER THE TECHNICAL VOCABULARY LEVEL AND TO ELIMINATE THE KEYS IRRELEVANT TO VOCATIONAL CURRICULUMS. (RS)

ED003260
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COOPERATIVE RESEARCH PROGRAM
No. 1350

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PART I

Cooperative Research Project No. 1350

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The research reported herein was supported through the Cooperative Research Program of the Office of Education, U. S. Department of Health, Education, and Welfare.

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ACKNOWLEDGMENTS

A great many individuals, both directly and indirectly, have been involved with this research. It is a pleasant task for the authors to indicate their many thanks to them all.

First, to Vice-Chancellor Lester Anderson whose initial suggestion to the senior author several years back sparked the idea for this cooperative research between the University and the vocational high schools of Buffalo.

Dr. Gerald Leighbody and Mr. Louis Gitin, both of the Board of Education of the City of Buffalo, were most cooperative in giving their enthusiastic endorsement to the project and for arranging our contacts with the principals and guidance personnel at the four schools. Their endorsement of the research constituted the initial go-ahead signal.

Thanks are due also to the principals and guidance counselors at the four vocational high schools for allowing us to invade their schools for testing and for the privilege of abstracting basic data about students from school files. The authors are most appreciative of the cooperation and expressed interest in the project of the following:

Mr. Frederick Kamprath, Principal, McKinley Vocational High School
Mr. Russell Mancuso, Guidance Counselor,(McKinley)
Mr. Robert May, Principal, Emerson Vocational High School
Mr. Daniel Krzezinski, Guidance Counselor, (Emerson)
Mr. LaVerne Engel, Principal, Seneca Vocational High School
Mr. Arthur Kreiner, Guidance Counselor, (Seneca)
Mr. Edward Wyatt, Guidance Counselor, (Seneca)
Mr. Joseph Crotty, Principal, Burgard Vocational High School
Dr. Irving Chriswell, Guidance Counselor, (Burgard)
Mr. James Foley, Guidance Counselor, (Burgard)

To Dr. Kenneth Clark, the author of the Minnesota Vocational Interest Inventory, our many thanks for his kind permission to duplicate the unpublished inventory and his provision for the scoring stencils for the civilian keys.

Special thanks and commendations are due also to personnel at the Vocational Counseling Center of the State University of New York at Buffalo for special services: To Mr. Thomas Dickinson and Mr.Thomas DuBois, graduate research assistants, for all computations and workups of data into statistical tables; to Mrs. Katherine Wejnarth, secretary, for her very painstaking efforts in typing the manuscript and the tabular data.

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Buffalo, New York

June, 1963

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Part I

An Overview

This is the first of a proposed two-stage study of the interests of vocational high school students. The primary goal is to see if the Minnesota Vocational Interest Inventory (MVII) holds promise for the selection and counseling of students in vocational high schools. It is hoped these studies will help make more clear the part which interests have in choosing and adjusting to these training programs and later vocations.

The MVII was constructed for use with persons whose interests focus on the skilled trades and related occupations. Since it was standardized on adult workers, its value for high school boys remains unknown. The first study investigates the agreement between MVII scores, or patterns, and present enrollment in different vocational courses. The second study will investigate the MVII's capacity to predict senior year status for freshmen tested earlier and the jobs engaged in several years after high school graduation.

Several factors may decrease the practical validity of the MVII for high school boys. They may lack sufficiently mature or realistic interests, as measured by tests; outside administrative or socio-economic pressures may determine the choice of given training programs; parental guidance may play a dominant role. It seems worthwhile to study the MVII's

usefulness in an on-going, realistic program of vocational education, especially because such outside factors are likely to persist. Some indirect evidence for maturational and ethnic group determinants of vocational choice are provided here. This is accomplished by comparing the interests and abilities of Negroes with whites and 9th with 12th graders in a variety of vocational programs.

Previous Research

The MVII is an empirically-derived inventory to measure, in the same manner as does the Strong Vocational Interest Blank, conformity of response to selected criterion groups. Criterion groups for the MVII now involve some twenty civilian skilled trade groups from the Minneapolis and St. Paul area. The project, under the direction of Dr. Kenneth E. Clark, also worked with extensive US Navy samples of skilled apprentices, so that there are two forms of the inventory: civilian and military. The present report concerns itself solely with the civilian form and civilian norms for this inventory. It represents a major contribution to interest measurement and may be regarded as an extension of the technical Group IV on the SVIB. The MVII is not, as yet, commercially available; appreciation and thanks are due to Dr. Clark for permission to reproduce the test format.

Full details of the construction and validation of the MVII are to be found in Clark's recent volume, The Vocational Interests of Non-professional Men (1961). Work on the MVII began in late 1946 and the first published report appeared some four years later (Clark, 1949). This first report details some of the difficulties in working with occupational groups of this kind and how, in the end, the mail questionnaire method was resorted to (but with full union cooperation) involving eight

A. F. of L. trade unions. Over 3,700 questionnaires were mailed to the total membership of these eight unions with a percent of usable return rate varying from 47 to 84. Scoring keys were developed which were composed of items clearly differentiating the criterion group from a tradesmen-in-general group. This latter was made up of a sample of 25 inventories picked at random for each of the seven other trade groups involved, thereby making a total of 175 nonprofessional men who did not belong to the criterion group in question. Tilton's (1937) "percentage overlap" was used to measure how effectively these two groups were separated (percent of TIG exceeding the median of a particular skilled trade group). The 1949 report states that this varied from 2.0% to 14.3% and with a median value of 6.3%. In other words, this means that about six out of 100 workers not in a given trade make scores above the median of workers on the scoring key developed in this study.

A second publication (Clark & Gee, 1954) elaborates on this. In addition to "percentage overlap", a second criterion for the evaluation of a scoring key is its reliability. Test-retest reliability was obtained from scoring inventories completed by 90 men students at the Dunwoody Industrial Institute in Minneapolis. Careful consideration was given, always employing cross-validation procedures, as to how best to construct the final scoring key by taking into account both overlap and reliability. A series of scoring keys was developed, originally on the civilian electrician sample: a 6% key, for example, which used all the items differentiating electricians from TIG with a difference of 6% or more; similarly, a 7% key and so on up to a 26% key. It was discovered that very little was lost in the way of test-retest reliability by a radical reduction in

the number of items in any one scoring key. Clark's first report (1949) indicates that the somewhat arbitrary decision was made to select items for scoring keys which differentiated the responses of the criterion group from TIG by 11% or more.

A different sort of criterion to evaluate the MVII would be the relative success of the various keys in predicting school success or advancement in the trade. In the early stages of the MVII project, this was not considered. Clark's recent book (1961, Ch 6), however, reports considerable data using Navy samples where the MVII is clearly helpful, along with aptitude test data, in predicting success and achievement in Navy technical schools. One finding of particular interest emerges where level of general intellectual ability is controlled. With a Navy Electronics Technician sample, for example, the maximum correlation between interest and achievement is a fairly high .47 for individuals with General Classification Test scores just under the mean for their group. Similarly, with Aviation Machinist Mates: here a correlation of .62 at the 60-62 GCT level indicated that when learning ability was just adequate, the motivational aspects of interests then could play a significant in school achievement. (Clark, 1961, p 89).

Christiansen (1960) has reported on the relationship between measured and claimed interest areas with the MVII when administered to a sample of vocational high school seniors. Claimed interests were measured by an alphabetically arranged list (which students checked) of the 20 occupations for which the MVII is scored. The median correlation obtained was only .35 between measured and claimed interests.

There have been a few studies reporting a relationship between

MVII scores and job satisfaction. Perry (1960) stresses the point that criterion groups should be selected where such selection can be based on a measure of occupational satisfaction. He cites the example of the Shipping Clerk scoring key, originally constructed on a St. Paul group. This did not satisfactorily cross-validate when tried out on a Minneapolis sample and, to confound things more, the key constructed on the basis of responses of this Minneapolis sample, did not cross-validate on St. Paul either. Yet the St. Paul key, when tried out on Navy yoemen, worked! It was ascertained that 91% of the St. Paul sample, a mature group with an average of four years on the job, said they would not choose the same career again -- so it was not surprising that such a group produced atypical results. This would suggest that, in addition to school achievement, occupational satisfaction might also be a satisfactory criterion; at least occupational status alone is a questionable one.

Further support for this is found in the work of Ghei (1960) who reports effective use of the MVII with a group of satisfied IBM machine workers. A special scoring key, constructed to differentiate satisfied workers from the reference group of TIG, did a better job than a usual classification-type key which merely aims to predict career group membership.

A good deal of other empirical work with the MVII largely remains unpublished. Scott (1960), at the Minneapolis VA Hospital where the MVII has been used since 1956, made a study of all MVII profiles in the files from 1956 to 1959. He located two groups of individuals: 244 patients whose files produced both SVIB and MVII profiles; another 266 with only MVII profiles. In addition, he used 271 senior boys from three Minneapolis

high schools, all of whom took the SVIB. His interest was in counseling interpretations which might be obtained via the MVII and how certain MVII scores related to SVIB scoring keys. The Baker key was shown to be not especially meaningful unless it was paired with a high score on the Food Service Manager key, the latter being a better measure for uncovering "food" interests. The construction keys (Carpenter, Painter, Plasterer) were not as effective in registering interests as were the electrical keys (Electrician and Radio/TV Repairman); furthermore, these electrical keys were most closely related to the SVIB Group II than to any other grouping. High clerical scores (IBM Operator and Stock Clerk) tended to do with clear mechanical reject patterns. High ability individuals tended to have elevated scores for Electrician, Machinist, Hospital Attendant, Radio/TV Repairman; low ability people were more often "high" on Truck Driver and Warehouseman. The electrical keys had the highest relation to general ability level.

Bradley (1958) in another unpublished PhD dissertation reported on the MVII, together with other aptitude tests, and its relation to academic success as measured by grades in trade courses at the Dunwoody Industrial Institute. Seventy-eight percent of his group were high school graduates. His data consisted of biographical items (via a questionnaire) plus scores from the Kuder Preference Record, the AGCT, the Bennett Mechanical Comprehension Test and the Revised Minnesota Paper Form Board. It was later possible to substitute the MVII for the Kuder as well as to add a basic arithmetic achievement test (the Woody-McCall Fundamentals of Arithmetic). All entering students for the academic year 1953-54 were tested plus an additional sample, to be used for cross-validation purposes, in 1954-55. The total number of cases for both years

was 1163. Regression analyses were done, based on AGCT, Bennett (Form AA), RMPFB with course grades as the dependent variable. The MVII was only employed with the 1954-55 cross-validation group (N = 319). Some of the Rs are surprisingly high (examples: .70 against carpentry grades, .75 against grades in the Auto Mechanics course). The best single predictors of course grades were the aptitude measures:

.68 for AGCT against grades in 17 different courses

.52 for the Bennett

.35 for the RMPB.

Sample results, solely with individual scoring keys from the MVII, are of special interest. For example, the MVII Mechanics score correlated .49 with grades in the Auto Mechanics course, .48 for Sheet Metal Worker score against grade in Building Construction curriculum. On the other hand, the MVII Printer key correlated -.07 with grades in the Dunwoody printing course; the Pressman key -.04 with printing course grade.

A Naval Air Technical Training Command study (1956) reported that, when the MVII was used in connection with assignments of recruits to five Navy technical schools, the interest inventory produced valuable results. Aptitude test data (such as general ability, mechanical and clerical aptitude test scores) were also available to aid in the prediction of final course grades. Results for the MVII were not entirely consistent but, especially in the case of the Aviation Machinist curriculum, the R against course grades for only the aptitude test data was .588; with MVII added, R jumped to .633.

Campbell (1962) has published data from his 1960 Minnesota PhD dissertation where he compared the validity of two methods of scoring

the MVII. One of these methods was the Clark technique of specific scoring keys built to differentiate the criterion group from TIG; the other method involved a configural scoring technique using the six possible patterns of response with the triad (as "like A-Dislike B," "Like A-Dislike C," etc.). Again the validity statistic employed was Tilton's percentage overlap. Three occupational keys were developed and cross-validated: painter, printer, electrician. Results showed that these experimental or configural-scoring keys were either equal to or slightly less effective than the current keys -- but that they accomplished this by utilizing far fewer test items. This, of course, raises the problem of reliability; Campbell was unable to produce relevant data on this issue.

Description of the MVII

The MVII was developed to serve essentially as an instrument to measure interests in the skilled trade area. At the outset, however, the possibilities of development of other types of scoring keys was recognized (such as Retail Salesclerk); The inventory consists of 570 items arranged in triads (or 190 triads). This forced-choice format requires the testee to select from each triad the one activity he most and least likes. Campbell and Sorenson (1963) have recently shown that this inventory is essentially free of any response bias caused by item location within the triad. Time for administration varies typically from 45 minutes to 1½ hours per client.

The inventory is in two forms: civilian and military. Test content is identical for both, the only difference between the two being in the face sheet.

Separate scoring keys are now available for 20 occupations, mostly of the skilled trade type: Bakers, Carpenters, Electricians, IBM Operators, Machinists, Mechanics, Milk Wagon Drivers, Painters, Plasterers, Plumbers, Pressmen, Printers, Sheet Metal Workers, Stock Clerks, Truck Drivers, Warehousemen, Retail Sales Clerk, Food Service Managers, Hospital Attendant, Radio/TV Repairman. Aside from the general information that the early skilled trade groups are from the St. Paul and Minneapolis area, admittedly introducing a geographical bias into the results, little is known concerning the specific composition of these criterion groups. The original work was done with eight A. F. of L. union groups and with the cooperation of both the union officials and employers. Inspection of the titles of some of the other scoring keys will clearly indicate that other, non-union, non-skilled-trade groups have been utilized. Presumably the composition of these will be completely described by Clark when the first Manual for the MVII becomes available (to be published by the Psychological Corporation in New York City.)

The immediate relevance of many of these scoring keys to counseling needs of vocational high school boys (as well as for the guidance people in these high schools) is readily apparent. It has long been thought that differentiation of interests at that level -- at least with current inventories -- was impossible. Motto (1959), for example, using Kuder scores to predict vocational school success, found that these students produce essentially flat profiles and that none of the scales could be used to differentiate successful from unsuccessful students. If, with this more specially designed interest inventory, it could be shown that these adult criterion groups "work" at the vocational high school level,

this would constitute an enormous help to all guidance people. Furthermore, as Wolfbein (1961) has shown, the number of skilled workers for the USA as a whole is expected to increase. The vocational high schools are the major suppliers of these workers. About three of every four craft workers are year-round full-time workers. The biggest contribution to present unemployment figures is the high vocational school drop-out rate. Such facts point to even greater urgency for improvements in the counseling of vocational high school boys.

Hypotheses

Three general questions influenced the design of the study. The first concerns the matter of agreement between MVII scores, or patterns, and membership in given vocational high school curricula. Will the highest scores be found on those scales which are most related to chosen vocational programs? Will lower scores be found for unrelated MVII scales? Positive results would constitute "concurrent validity" for the MVII and these would strongly support its use in the selection and counseling of students for vocational programs.

A second question concerns maturational and ethnic group factors which might influence the concurrent validity of the MVII. Will freshmen (i.e., 9th graders) show less clearcut or consistent MVII patterns than seniors? Will Negroes and whites in the same grade, or in the same trade program, show similar MVII patterns? Significant grade or ethnic group differences would suggest that factors other than interest largely determine enrollments in vocational high school programs. For this reason,

separrte comparisons of interest scores and vocational program membership would be required for each subgroup.

The third question deals with the possible relationship of several ability measures to both interest scores and chosen vocational programs. Will interests or the choice of a given trade vary with general intelligence, or with special aptitudes? Will these measures be related in a different way for freshmen and seniors, for Negroes and whites? Answers to this last question would also shed light on possible maturational and ethnic factors underlying the choice of vocational programs of training.

The research design called for testing over 1000 boys in the 9th and 12th grades of four Buffalo vocational high schools. This project had the enthusiastic support of the Board of Education of the City of Buffalo, as well as the full cooperation of the guidance counselors in the four schools. Major training programs represented in the sample are the building, electrical, food service, machinist, mechanical and printing trades. Besides the profile of 20 MVII scores obtained for each boy, school records provided eight different measures of ability. These included general verbal intelligence, special aptitudes, and average grades in shop and academic courses.

Specific hypotheses tested in the study are:

1. Average scores on the MVII and on the eight ability measures (intelligence, aptitude, and achievement) are the same for 9th and 12th graders and for Negroes and whites in vocational high schools.

2. Profiles of average scores on the MVII are the same for boys in similar vocational programs at either the 9th or 12th grade level, but are different for boys in dissimilar programs at either grade level.
3. The proportions of vocational high school boys who score "high" on a relevant MVII scale are larger for boys enrolled in the related trade than for boys enrolled in other trades.
4. Boys in different vocational courses will have different average scores on measures of intelligence, special aptitude, and achievement in vocational courses.
5. Average MVII scores will differ for boys classed as "high", "medium", or "low" on measures of general intelligence, special aptitude, and achievement in vocational courses.

PROCEDURES

Subjects

The choice of subjects was largely determined by the wish to validate the MVII for vocational high school boys, plus the availability of a large local sample. Officials at the four Buffalo vocational schools provided time for all 9th and 12th graders to participate in the testing. Thus a basic pool of subjects was established, both for testing the concurrent validity of the MVII against course enrollments and for testing the predictive validity of the MVII. The latter concerns a second study, planned for 1965, to determine if later 12th grade enrollments agree with the 9th grade interest scores and if the 12th grade interest scores predict occupational status several years later.

Usable MVII scores were obtained for 1,114 boys in the 9th and 12th grades of the four Buffalo vocational high schools. Only a handful were absent on the day of testing and several were eliminated because their MVII answer sheets were incorrectly marked. Table 1 lists the numbers of boys by trade and ethnic group within each class level.

About 58% of the total sample are 9th graders and 42% are 12th graders. Most of the freshmen were committed to one of the major trade programs offered at the 9th grade level but they had not elected a specialized trade within this broad field; most designations for Grade 9 programs therefore appear as "unclassified" in Table 1. This is consistent with administrative policy against final commitments during this first year in vocational high school. The six major groups represented in the total sample are the building, electrical, food service, machinist, mechanical, and printing trades. The electrical, machinist and mechanical programs are clearly the most popular at Grade 9; they remain so also at Grade 12. Almost 10% of the sample are Negroes and these are well scattered through the different trade groups. Except where the groups are quite small, the proportions range close to one-tenth.

All the boys were urban residents of Buffalo. By their own description, most of their fathers were employed in skilled and semi-skilled occupations, but some were listed as independent businessmen or as teachers and a wide variety of other fields. Over one-third of the boys indicated their mothers also worked outside the home in some sort of gainful employment (typically waitresses, office workers, etc.).

Table 1

Distributions of the Vocational High School Subjects by Grade, Trade, and Ethnic Group

Trade	Grade 9			Grade 12			Combined Total
	White	Negro	Total	White	Negro	Total	
Building, Uncl.	69	5	74				74
Bricklaying				5	2	7	7
Carpentry				16	3	19	19
Plastering				5	1	6	6
Plumbing				14		14	14
Sheet Metal				6		6	6
Woodworking				21	2	23	23
Electrical, Uncl.	163	14	177				177
Electrical, Gen.				104	1	105	105
Electrical, Radio				28	3	31	31
Electrical, Indust.				17	2	19	19
Foods, Baking	11	2	13	3	1	4	17
Foods, Quantity	18	6	24	3	1	4	28
Machinist	117	8	125	84	6	90	215
Welding				8		8	8
Tool Design	8	1	9	7		7	16
Mechanic, Auto	125	22	147	56	8	64	211
Mechanic, Aviat.	60	14	74	38	2	40	114
Mechanic, Marine				5		5	5
Printing				16	3	19	19
Total	571	72	643	436	35	471	1114

Collection of Data

MVII scores, the primary data, were obtained through group administrations of the self-report inventory at special meetings scheduled by the school authorities. All 9th graders were tested during January of the 1961-62 school year; 12th graders were tested during April and May, just before graduation.

Approximately one and one-half hours were needed for this testing. An initial half-hour was spent getting pertinent facts about age, grade, school program, and parental occupations. The testing went much more smoothly for the seniors than for the freshmen, for several reasons. The latter had more difficulty reading and understanding special terms in the MVII booklet and they were less able to concentrate for a long time. It seemed they also had less appreciation for the possible values of this testing, for research or any other purpose.

Official school records were searched at the end of the school year for ability test scores and school grades. These scores included: the Lorge-Thorndike test of verbal intelligence; five subtests from the Differential Aptitude Test battery; grades in both academic and shop courses.

Most of the boys were tested for intelligence with the Lorge-Thorndike while still in the 8th grade. The exceptions had Otis IQ scores on their records and these were administered at different times. Both sets of IQ scores were considered similar since inspection showed the few Otis scores to center near 100. The Buffalo vocational schools traditionally use only five subtests from the Differential Aptitude Test

battery and these are given at different stages throughout the high school period. The school officials cooperated with this project by administering all five of these subtests to the 9th graders during the 1961-62 year. Included were the tests for Verbal Reasoning, Numerical Ability, Abstract Reasoning, Space Perception, and Mechanical Reasoning for purposes of direct comparison. Finally, average grades in so-called academic and shop courses were determined for each boy. The schools' own permanent record forms identified individual courses as such and, obviously, the averages for 9th graders were based on far fewer courses than for 12th graders.

Data Processing

The IBM 1620 Computer provided major assistance with describing and analyzing the data. All data were first punched into basic data cards, two for each subject. Since many of the MVII raw scores were negative, a constant of 50 was added to each score to keep it within the bounds of 01 and 99. This procedure insured more accuracy and convenience for computer programming than would have transformations to Clark's published normative scales for the MVII. The latter transformation requires visual discrimination, a source of some error. The MVII results reported below, with certain exceptions, are converted to Clark's scaled values for more easy interpretation.

Variables used in the study

A simple list of the variables is provided here, along with a brief description:

Ability and interest variables:

1. Vocational trade interests (includes 20 MVII scores for each subject)
2. General intelligence (a single IQ index based on the Lorge-Thorndike for most subjects, on the Otis for a few subjects)
3. Special aptitudes (includes five of the seven Differential Aptitude Tests, Form A: Verbal Reasoning, Numerical Ability, Abstract Reasoning, Space Perception, and Mechanical Reasoning).
4. Achievement in academic courses (average grade)
5. Achievement in shop courses (average grade)

Classification variables:

1. Vocational trade (the school program which provides basic preparation for a given skill or vocation)
2. Grade level (9th or 12th grade)
3. Ethnic group (Negro or white)
4. High vocational trade interest (Intervals on the MVII scales ranging from 55 and up using Clark's civilian norms). A score of 55 is 1½ standard deviations above the obtained mean of Clark's Tradesmen-in-general group)
5. Ability level (score ranges for each of these measures to represent high, medium and low groupings; inclusive medium score range values for various measures are: 91-109 for IQ indices, 21-79 percentile spread for each of the DAT subtests where Grade 9 national norms were employed, 70-84 for academic and shop school averages).

RESULTS

Interest and ability differences between grade and ethnic groups

Table 2 summarized the Mean MVII scores and standard deviations for the total vocational high school sample, when separated by grade and by ethnic group. Also indicated are the t-test results for Grade 12 versus Grade 9 and for Negro versus white (irrespective of grade placement.) Similarities far outweigh differences and the few statistically significant differences shown in Table 2 have little practical meaning. Generally, both the 9th graders and the Negroes show somewhat higher clerical and personal service interests than do the 12th graders or the whites. From Table 1 we see that two-thirds of the Negro sample are 9th graders; possibly, the Negro subjects account for these slight differences between freshmen and seniors. Casual inspection of Table 2 shows that there are more significant differences (those at the .01 level) between grades than between ethnic groups, suggesting that age is probably the more crucial factor -- as indeed it should be where the field of interest measurement is involved, especially with such youthful samples as those dealt with here.

All the mean standard scores in Table 2 can be directly compared against Clark's civilian norms where a score of 40 is taken as the mean

Table 2

Mean Standard Scores on the Minnesota Vocational Interest Inventory, Standard Deviations, and t-test Results for Different Grade and Ethnic Groups

	Grade 9		Grade 12		White		Negro	
Scale	$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$	S
Bakers	53	10.0	49**	10.6	51	10.3	55**	10.7
Carpenters	31	10.9	32	10.7	32	10.7	28*	11.2
Electricians	41	11.4	42	12.8	42	12.0	40	11.4
I.B.M. Operators	46	7.5	45**	9.7	44	8.6	47*	8.1
Machinists	35	8.8	37*	9.5	36	9.1	34	9.4
Mechanics	33	7.6	37**	9.3	36	8.4	29**	7.9
Milk Wagon Driver	45	8.7	43**	10.6	44	9.7	47*	8.4
Painters	38	9.0	37	9.5	37	9.3	37	8.7
Plasterers	38	8.8	38	9.0	38	9.0	37	8.1
Plumbers	33	8.0	36**	9.6	35	8.8	31**	8.8
Pressmen	40	9.6	40	10.4	40	10.0	41	10.0
Printers	44	7.9	42**	10.0	43	9.0	46*	8.7
Sheet Metal Workers	35	9.1	41**	9.8	37	9.5	33*	9.1
Stock Clerks	51	8.8	53*	12.0	51	10.3	55*	9.7
Truck Drivers	41	8.9	43**	9.3	42	9.0	40	9.5
Warehousemen	46	7.5	46	9.0	46	8.1	46	8.4
Retail Sales Clerks	46	9.3	44**	10.5	45	10.0	47*	9.4
Food Service Managers	46	8.0	43**	9.0	45	8.4	47**	8.9
Hospital Attendants	43	7.2	41**	8.2	42	7.7	43*	7.2
Radio - T.V. Repairmen	42	11.3	42	13.8	42	12.5	42	12.1

* $P < .05$
** $P < .01$

for his Tradesman-in-General group. At both grade levels, most of the scores cluster around this reference point of 40: the mean standard score for the entire Grade 9 sample is 41.45; that for the entire Grade 12 sample, 41.55. In both instances the two radical departures from this are the scores for Stock Clerk (surprisingly elevated) and those for Carpenter (low).

In Table 3 we find comparable data on the ability measures. All DAT results have been converted into Grade 9 normative data as in the DAT Manual (Bennett, et al, 1959). Significant differences may be noted between 9th and 12th graders on the aptitude and achievement measures, but not on the test for general intelligence. For example, 9th graders average higher scores on the Differential Aptitude Tests for Verbal Reasoning, Numerical Ability, and Abstract Reasoning. But 9th graders average lower on subtests for Space Perception and Mechanical Reasoning plus academic and shop grades. One might conclude that qualitative differences in ability help determine which students persist from the 9th to the 12th grade. The scholastic aptitude test results suggest that the more intellectually able students leave vocational high schools. The spatial and mechanical aptitude test results suggest that the more technically skilled students stay. Furthermore it is these types of aptitude measures which provide better predictions of vocational high school success; such aptitude tests are those on which vocational students typically test higher (Doppelt, et al, 1959).

The Negro subjects show lower averages than the whites on all the ability measures save one. This single exception, the DAT-Abstract

Table 3

Average Ability Scores, Standard Deviations, and t-test Results for Different Grade and Ethnic Groups

Scale	Grade 9 (N=643) $\bar{X}$	S	%tile[a]	Grade 12 (N = 471) $\bar{X}$	S	%tile[a]
I.Q. (Lorge-Thorndike)	100.0	11.5		100.5	12.4	
D.A.T.						
Verb. Reas.	16.1	6.7	45	14.3**	6.7	35
Num. Abil.	17.3	6.9	55	13.6**	5.4	40
Abs. Reas.	25.1	10.3	45	19.9**	10.1	30
Space Relat.	33.4	19.6	45	37.6**	20.6	50
Mech. Reas.	33.4	11.5	40	36.2**	11.3	50
Academic Average	72.9	8.7		77.1**	6.6	
Shop Average	75.2	9.4		82.3**	5.7	

Scale	White (N=1007) $\bar{X}$	S	%tile[a]	Negro (N=107) $\bar{X}$	S	%tile[a]
I.Q. (Lorge-Thorndike)	100.9	11.6		94.0**	12.9	
D.A.T.						
Verb. Reas.	15.7	6.8	45	13.5**	6.0	30
Num. Abil.	16.9	6.8	55	14.4**	6.4	40
Abs. Reas.	24.6	10.5	45	23.2	9.8	40
Space Relat.	37.4	20.4	50	26.0**	18.1	35
Mech. Reas.	34.7	11.6	50	30.5**	10.2	35
Academic Average	74.9	8.0		72.0**	9.4	
Shop Average	78.6	8.6		74.7**	9.5	

[a] Form A, Grade 9 Norms, Differential Aptitude Tests

* $P < .05$
** $P < .01$

Reasoning, is of considerable interest since it is regarded as having "non-academic" content. But there is no basis to determine here the causal factors which underly these scores. Since Negroes are fairly well scattered throughout the vocational trade group, it seems unnecessary either to exclude them from the study or to analyze their interest scores separately in further detail. For several reasons the interests of 9th and 12th graders in different trades will be analyzed separately. Somewhat different trades, or specialties within a trade, are represented at the two grade levels; interest test results and, especially ability test results differ between the two grade levels; most of the Negro sample is enrolled in the 9th grade and it is assumed that dropouts before the 12th grade occur for different reasons for the Negroes in contrast to the whites.

Interest profiles for different trades

Profiles of average MVII scores were determined separately for each trade at each grade level. The resulting means, shown in Tables 4 and 5, have been transformed to Clark's adult civilian scales. Actual graphs of these profiles, but only for the major trade groups at each grade level, are given in the Appendix.

Interpretation of the average scores in Tables 4 and 5 should take into account Clark's data, where a score of 40 on each scale constitutes the mean for "Tradesmen-in-General". With a standard deviation of 10, scores of at least 50 or 60 suggest similar or strongly similar interests to adults employed in the occupation represented by each scale. A score of 60 on one of these scales means that a student's score falls at the mean of the criterion group. Scores of 30 and below indicate

Table 4

Profiles of Average Minnesota Vocational Interest Inventory Scores (Adult Norms) for 12th Grade Buffalo Vocational School Trades

Trade	Scale	Baker	Carpenter	Electrician	IBM Operator	Machinist	Mechanic	Milk Wagon Driver	Painter	Plasterer	Plumber	Pressman	Printer	Sheet Metal Worker	Stock Clerk	Truck Driver	Warehouseman	Retail Sales Clerk	Food Service Manager	Hospital Attendant	Radio/TV Repairman
Bricklaying		47	44	34	49	29	35	42	43	49	40	36	40	41	84	52	50	43	44	45	34
Carpentry		51	45	37	45	29	28	46	49	40	31	36	40	38	62	44	49	46	43	43	35
Plastering		47	48	38	45	33	38	42	67	40	34	39	42	46	53	44	46	42	41	40	35
Plumbing		47	33	40	43	31	38	46	67	44	51	34	40	46	70	43	49	44	44	40	33
Sheet Metal		54	39	34	43	40	38	44	43	40	63	42	44	47	65	40	43	47	48	45	37
Woodworking		44	46	49	44	35	35	40	45	38	31	37	42	38	52	39	52	43	40	39	38
Elect., Gen.		47	27	51	44	34	38	43	34	34	33	40	40	36	50	46	44	43	41	39	51
Elect., Rad.		48	23	52	45	39	35	43	30	34	33	42	41	36	52	40	39	43	41	43	58
Elect., Ind.		47	25	51	44	41	45	44	30	36	37	37	39	40	46	46	38	42	43	39	50
Foods, Bak'g		80	33	25	51	44	20	59	45	38	25	32	47	29	62	45	53	54	68	47	30
Foods, Quant.		80	33	35	49	34	18	54	36	44	23	46	49	24	64	42	50	49	70	45	35
Machinist		46	37	32	43	43	38	40	38	38	39	38	42	44	52	39	48	43	42	43	35
Welding		50	33	43	42	32	32	43	34	39	39	40	45	41	54	44	56	50	44	48	40
Mech., Auto		52	34	39	45	36	39	44	40	39	34	38	40	39	48	46	48	45	46	41	39
Mech., Aviat.		46	33	43	45	44	43	40	34	38	39	38	42	40	50	40	40	43	45	44	44
Mech., Marine		42	37	45	38	23	33	55	37	34	42	24	49	40	41	51	44	41	40	36	41
Printing		51	21	37	50	31	20	50	33	31	20	55	59	23	59	34	44	49	43	43	45

Note: Standard scores are underlined to indicate the most relevant (criterion) scales for each of the student groups.

Table 5

Profiles of Average Minnesota Vocational Interest Inventory Scores (Adult Norms) for 9th Grade Buffalo Vocational School Trades

Trade	Scale	Baker	Carpenter	Electrician	IBM Operator	Machinist	Mechanic	Milk Wagon Driver	Painter	Plasterer	Plumber	Pressman	Printer	Sheet Metal Worker	Stock Clerk	Truck Driver	Warehouseman	Retail Sales Clerk	Food Service Manager	Hospital Attendant	Radio/TV Repairman
Building, Uncl.		50	41	37	44	32	29	44	44	42	35	36	42	40	49	41	50	45	45	44	36
Electrician, Uncl.		51	28	48	46	37	35	46	35	33	30	42	44	31	50	40	40	46	44	43	51
Foods, Baking		69	26	33	48	39	20	60	42	38	20	39	47	20	60	42	52	53	51	44	34
Foods, Quantity		73	22	31	50	42	10	60	42	34	23	37	51	20	66	40	50	56	53	50	39
Machinist		48	35	36	45	43	34	43	34	38	33	40	45	38	52	36	49	46	46	43	37
Tool Design		42	28	39	46	42	33	40	40	41	37	41	47	39	48	34	52	46	46	42	39
Mechanic, Auto		57	32	37	45	33	34	46	38	39	33	38	44	35	50	44	49	47	46	42	39
Mechanic, Aviat.		51	25	43	45	38	40	44	36	38	34	41	45	38	50	40	42	46	44	44	45

Note: Standard scores are underlined to indicate the most relevant (criterion) scales for each of the student groups.

quite dissimilar interests with persons in these occupations. Those MVII scales which are closely related, or relevant, to each trade group in the high school sample have had their corresponding mean scores underlined in Tables 4 and 5.

Several trends among these average interest scores are apparent: both high and low scores help describe characteristic profiles for some of the trades; some, but not all, of the trades score highest on their own relevant scales; almost all of the trades score high on a few of the same scales (see Milk Wagon Driver and Stock Clerk).

The food, electrical, and printing trades have the most valid profiles at the 12th grade level. Both food groups, although very small, show their highest score on the Baker scale and their second highest score for Food Service Manager. Scoring high on both food interest scales is consistent with Scott's finding (1960) for his Minneapolis sample where he reported the Food Service Manager key was better for uncovering food interests than the Baker key. The Buffalo food groups score moderately high on clerical interest (IBM Operator and Stock Clerk) and personal service scales (Milk Wagon Driver, Hospital Attendant); their lowest scores are on the technical or manual trade interest scales.

The electrical groups are the only trades to average at least moderately high scores on Electrician and Radio/TV Repairman, the two criterion scales in this instance. Boys in the Radio/TV program score highest on this one; their average score of 58 is practically identical with the score of 60 for adults in the criterion sample. Scores on the building trade interest scales typically are low for these electrical

students, the one exception is the "general electrical" students, who come up with an exceptionally high Carpenter score. This group is, however, the most likely electrical trade to be involved in construction work.

The single printing trade group stands out for its many low scores. These students score moderately high (close to the criterion group score of 60) on the relevant Pressman and Printer scales; elevated scores also appear on such non-technical, or manual, scales as: Baker, IBM Operator, Milk Wagon Driver, and Stock Clerk.

Guidance uses of the MVII at the Grade 12 level, at least with this student sample, are not always encouraging. With the two food groups, we have a clear "hit." The two relevant scales clearly pick out these students and sharply focus on their trade interests. The students in the printing curriculum are also clearly spotted; on both the Printer and Pressman scales they are close to the criterion score of 60. The electrical students are spotted with only fair accuracy -- a "near hit." All the three student groups are correctly indicated by the two MVII scales for Electrician and Radio/TV Repairman. The best job of separation is done with the most specialized student group, that of Radio/TV. For all these student groups, then, the MVII has some clear guidance utility.

The situation is clearly otherwise with the students in various building trade programs as is also the case with student machinists, mechanics, welders. Here we have a clear "miss" where the inventory is not working. Students in these programs are frequently found to earn highest MVII scores on non-criterion scales.

Similar results, although with fewer "hits," are found for the 9th grade trades. Table 5 presents these results. The majority of the scores hover around the Tradesmen-in-General score of 40 which would suggest that the trade interests of these students are not as yet well differentiated. This is hardly an unexpected finding considering the lack of positive evidence for vocational maturity found (in a different student sample, to be sure) in the Career Pattern Study (Super & Overstreet, 1960).

Students in the Building Trades and Electrician groups are labelled as unclassified, a reflection of Buffalo vocational high school policy to expose these students at the Grade 9 level to a general orientation sort of course. It is not until their second year that students then divide up into specialities within these areas. If we disregard the generally high Baker score for most of the groups -- a finding also reported by Scott (1960) -- the MVII profile for the unclassified Building Trade group is flat; that for the unclassified electrical group is "better" in the sense that the students here are showing up with modestly elevated scores on the two criterion scales: Electrician and Radio/TV Repairman. The two food groups are sharply differentiated by means of both of the critical scales. Even should we choose to disregard the Baker scale, these groups are spotted by the Milk Wagon Driver scale and, less well, by the Food Service Manager scores. The other trade groups in Table 5 (Mechanics, Machinists, Tool Designers) are poorly differentiated, the majority of all MVII scores clustering around the mean of 40.

It appears that many students at the 9th grade level have vague interests or are undecided about their eventual trade. The tendency for so many boys to score high on non-manual or technical scales such as Baker, Stock Clerk, and Warehouseman, and low on the Carpenter, Mechanic, Plumber, and sheet Metal Worker scales, suggests a focus on "clean" work involving tangible operations. This trend appears at both the 9th and 12th grade levels.

Proportions scoring "high" on relevant interest scales

If the MVII is valid for high school boys, then proportionally more of the boys within a given trade curriculum should score high on scales which are closely relevant to that trade. This hypothesis was tested by comparing the proportions of boys within and without a given trade group who scored high on selected MVII scales. Scores of 55 or higher on Clark's civilian scales were arbitrarily chosen to represent "high" scores. Decisions as to which MVII scales were relevant to a given trade were based on similarity in name for the trade and occupational groups, Clark's data on scale intercorrelations (1961, p. 42), and the functional groupings suggested for certain MVII scales by Scott (1960).

The number of 12th grade boys within and without each trade who score high on each of the 20 MVII scales is shown in Table 6. These results are grouped separately for each major trade group and the several specialized trades within each group. The number of boys in a given specialty who scored high on relevant scales is underlined on each row;

Table 6

The Number of 12th Graders Within and Without Trade Scoring High on Minnesota Vocational Interest Inventory Scales with Chi-Square Tests for Differences in Proportions Scoring High on Relevant Scales

Trade	N	Scale	Baker	Carpenter	Electrician	IBM Operator	Machinist	Mechanic	Milk Wagon Driver	Painter	Plasterer	Plumber	Pressman	Printer	Sheet Metal Worker	Stock Clerk	Truck Driver	Warehouseman	Retail Sales Clerk	Food Service Manager	Hospital Attendant	Radio/TV Repairman
Bricklaying	7		2	2	1	3	0	1	1	0	4[c]	2	0	0	3	6	3	2	1	0	0	0
Carpentry	19		7	5[b]	1	4	0	2	5	5	4	0	1	0	3	10	2	5	2	1	3	0
Plastering	6		1	2	0	1	0	2	1	1	0	0[c]	0	0	1	3	0	1	0	1	0	0
Plumbing	14		4	0	0	1	0	2	3	1	3	4	0	1	5	7	1	4	1	2	0	0
Sheet Metal	6		5	1	0	0	1	1	1	0	0	0	1	1	2	3	0	0	0	0	1	0
Woodworking	23		4	8[c]	5	1	0	3	3	4	1	0	1	2	1	12	2	10	1	0	2	1
Total Const.	75		23	18[c]	7	10	1	11	14	11	8[a]	6	3	4	15	41	8	22	5	4	6	1
Non-Const.	396		114	17	95	53	48	73	78	15	12	12	18	58	49	147	54	92	46	44	21	81
Elect., Gen.	105		25	4	50[c]	16	9	18	24	1	0	2	2	7	7	30	16	26	13	7	2	33[c]
Elect., Rad.	31		10	2	18[c]	3	4	5	4	0	1	1	0	3	1	13	1	6	2	0	4	16[c]
Elect., Ind.	19		3	0	10[c]	2	3	5	2	0	1	0	0	1	2	5	5	1	2	2	0	5
Total Elect.	155		38	6	78[c]	21	16	28	30	1	2	3	2	11	10	48	22	33	17	9	6	58[c]
Non-Elect.	316		99	29	24	42	33	56	62	25	18	15	19	51	54	140	40	81	34	39	21	24
Total	471		137	35	102	63	49	84	92	26	20	18	21	62	64	188	62	114	51	48	27	82

[a] $P = .05$, [b] $P = .01$, [c] $P = .001$

Table 6 - continued

Trade	N	Scale	Baker	Carpenter	Electrician	IBM Operator	Machinist	Mechanic	Milk Wagon Driver	Painter	Plasterer	Plumber	Pressman	Printer	Sheet Metal Worker	Stock Clerk	Truck Driver	Warehouseman	Retail Sales Clerk	Food Service Manager	Hospital Attendant	Radio/TV Repairman
Foods, Baking	4		1	1	0	0	0	0	3	1	0	0	0	1	0	4	0	2	1	1	1	0
Foods, Quant.	4		1	0	1	0	1	0	3	0	1	0	1	1	0	3	0	1	0	1	0	1
Total Foods	8		2	1	1	0	1	0	6	1	1	0	1	2	0	7	0	3	1	2	1	1
Non-Foods	463		129	34	101	63	48	84	86	25	19	18	20	60	64	181	62	111	50	40	26	81
Machinist	90		18	6	3	6	17	17	10	5	3	4	2	12	20	37	8	23	5	5	5	1
Welding	8		3	0	2	0	0	0	2	0	0	0	0	1	1	2	1	3	3	2	0	0
Tool Design	7		7	0	0	1	2	1	0	0	0	0	0	1	1	6	0	1	0	1	1	1
Total Mach.	105		28	6	5	7	19[b]	18	12	5	3	4	2	14	22[a]	45	9	27	8	8	6	2
Non-Mach.	366		109	29	97	56	30	66	80	21	17	14	19	48	42	143	53	87	43	40	21	80
Mech., Auto	64		29	3	3	13	2	15	15	5	5	1	3	9	8	21	16	18	11	13	2	8
Mech., Aviat.	40		7	1	5	5	10	11	6	1	1	3	1	7	8	13	3	6	4	4	6	8
Mech., Marine	5		1	0	1	1	0	1	2	1	0	1	0	2	1	2	3	1	1	0	0	0
Total Mech.	109		37	4	9	19	12	27[a]	23	7	6	5	4	18	17	36	22	25	16	17	8	16
Non-Mech.	362		100	31	93	44	37	57	69	19	14	13	17	44	47	152	40	89	35	31	19	66
Printing	19		9	0	2	6	0	0	7	1	0	0	9	13[c]	0	11	1	4	4	2	0	4
Non-Print.	452		128	35	100	57	49	84	85	25	20	18	12	49	64	177	61	110	47	46	27	78
Total	471		137	35	102	63	49	84	92	26	20	18	21	62	64	188	62	114	51	48	27	82

[a] P = .05, [b] P = .01, [c] P = .001

results of chi-square tests for significance of differences at the .05, .01 and .001 levels are indicated by a, b, c. Chi-square values were computed in two general ways: (1) trade specialty (such as carpentry) versus total non-construction students who scores high on this relevant Carpenter) scale and (b) total in the general class versus all others (example from Table 6: total construction students scoring high on the MVII Carpenter scale versus total non-construction students who also scored high on this same scale). Thus for (a), in Table 6, there were 5 out of 19 carpentry students who scored high (standard score of 55 or better) on the Carpenter scale. Seventeen out of 396 students in non-construction curricula also scored high on this same scale. This difference in proportion checks out as significant at the .01 level. With (b), this second comparison is with the larger, more generalized groups: the 18 construction students (from a total of 75) who scored high on the Carpenter scale versus the 17 non-construction students (total here of 396) who also scored high on this same scale. Here the significance level worked out to be .001.

These proportions of students scoring high on the MVII scales in Tables 6 and 7 lead to almost the same conclusions as do the data based on average scores. Again, the MVII is somewhat more valid with seniors than freshmen and the best results occur for the food, electrical, and printing trades. Boys in most of the trades score high on non-technical scales such as Baker, Stock Clerk, and Warehouseman. This last result might be due to any one of several reasons: immature interest development, drifting into inappropriate training programs, or a strong preference for "clean" work involving tangible, or non-intellectual, activities.

Table 7

The Number of 9th Graders Within and Without Trade Scoring High on Minnesota Vocational Interest Inventory Scales with Chi Square Tests for Differences in Proportions Scoring High on Relevant Scales

Trade	N	Scale	Baker	Carpenter	Electrician	IBM Operator	Machinist	Mechanic	Milk Wagon Driver	Painter	Plasterer	Plumber	Pressman	Printer	Sheet Metal Worker	Stock Clerk	Truck Driver	Warehouseman	Retail Sales Clerk	Food Service Manager	Hospital Attendant	Radio/TV Repairman
Build'g, Uncl.	69		24	18[c]	8	5	4	4	15	13[c]	10[c]	2	2	7	7	15	7	28	8	5	8	4
Non-Build'g	572		247	22	93	40	43	56	128	18	13	4	24	74	43	227	51	105	81	60	25	60
Foods, Baking	13		11[c]	0	0	1	0	0	9	2	0	0	1	3	0	9	3	4	7	2	0	0
Foods, Quant.	24		23[c]	0	0	2	0	0	16	2	0	0	1	9	0	22	2	3	14	7[b]	5	1
Total Foods	37		34[c]	0	0	3	0	0	25	4	0	0	2	12	0	31	5	7	21	9[b]	5	1
Non-Foods	604		237	40	101	42	47	60	118	27	23	6	24	69	50	211	53	126	69	56	28	63
Machinist	124		34	5	9	9	21[c]	14	22	3	4	1	6	21	18	52	3	36	16	11	4	2
Tool Design	9		1	0	0	1	2	0	1	0	0	0	1	1	1	3	0	4	0	0	1	0
Total Mach.	133		35	5	9	10	23[c]	14	23	3	4	1	7	22	19	55	3	40	16	11	5	2
Non-Mach.	508		236	35	92	35	24	46	120	28	19	5	19	59	31	187	55	93	74	54	28	62
Mech., Auto	145		76	8	6	5	2	10	27	5	4	1	0	16	11	51	17	33	18	18	5	4
Mech., Aviat.	74		27	0	4	4	7	10	12	2	1	2	5	7	8	25	12	6	3	6	4	6
Total Mech.	219		103	8	10	9	9	20	39	7	5	3	5	23	19	76	29	39	21	24	9	10
Non-Mech.	422		168	32	91	36	38	40	104	24	18	3	21	58	31	166	29	94	69	41	24	54
Total	641		271	40	101	45	47	60	143	31	23	6	26	81	50	242	58	133	90	65	33	64

[a] P = .05, [b] P = .01, [c] P = .001

A major advantage of comparing proportions of boys within and without a trade who score high on relevant scales is the indication of efficiency in prediction. The proportions of "hits" and "misses" can be calculated from the data in Tables 6 and 7. For example, predicting in which trade boys are enrolled should be a clean hit for most boys in the food, electrical, and printing trades (Table 6). If we use only the relevant scales there will be a number of "false positives", since several boys outside these trades also score high on the relevant scales. This makes it necessary to consider other profile characteristics for each trade.

Efficiency in prediction decreases sharply for other trades, even when the data show significantly greater proportions scoring high on relevant MVII scales. Consider the contruction trades in Table 6. About 63% of the combined construction trade boys score high on one or more of the relevant scales, while 23% of the non-construction trade boys score high on one of these same scales. With the Machinist group, we see high scores on both relevant and non-relevant MVII Scales. Clearly, high scores on closely relevant MVII scales constitute a very poor basis for predicting current enrollment in certain of these high school trades.

Table 7 presents the results from the chi-square analyses for Grade 9. As was noted when the data for Grade 9 in terms of average MVII scores were presented (Table 5), the trends are obscure. At this immature age level, we come up with so many high scores -- regardless of the student's school placement -- on the MVII scales for Baker, Stock Clerk, Milk Wagon Driver, Warehouseman as to make the data relatively meaningless. At least with these vocational high school samples, the MVII fails to work well at this level.

Ability scores for different trades

Differences in aptitudes between the 9th and 12th grade samples have already been reported. Here we examine ability differences between different trade groups at the two grade levels. Tables 8 and 9 summarize the means and standard deviations of eight different ability measures for trades at the 12th and 9th grade levels. Data are missing for certain entire trade groups and, in some cases, for a few boys within the other trades. Included in Tables 8 and 9 are 9th grade percentile equivalents needed to interpret the DAT.

The average IQ's for the 12th and 9th grade trades range closely about the population mean of 100. The most striking deviations involve the 12th grade Radio/TV mean of 111 and the two food groups' mean of approximately 87 (but these are data for only eight students here). These trends appear at the 9th grade level (Table 9) and are reinforced by parallel differences on other ability measures. Generally, the electrical trade boys constitute an "elite" group, with above-average scores on all of the ability measures. The Radio/TV group, for example, has a distinctly higher academic average than the other groups in addition to its higher aptitude scores. The food trades, by comparison, have the lowest scores; the one "good" score is obtained on Space Relations. Such differences as these, as between the abilities of electrical and food trade boys, strongly indicate different requirements for success in various trade programs. Intellectual ability appears to be much less important for the food trades than for the electrical trades.

The generally average IQ scores for most of the vocational high school groups will come as a surprise to those readers who conceive of

Table 8

Average Ability Scores and Standard Deviations
For 12th Grade Trade Groups

		I.Q.		D. A. T.														Acad. Aver.		Shop Aver.	
				Verb. Reas.			Num. Abil.			Abs. Reas.			Space Relat.			Mech. Reas.						
Trade	N	X	S	X	S	%ile[a]	X	S	%ile[a]	X	S	%ile[a]	X	S	%ile[a]	X	S	%ile[a]	X	S	X	S
Bricklaying	7	99.7	17.0	15.1	4.6	45	16.1	4.1	50				29.7	19.0	40				78.6	4.5	88.7	3.6
Carpentry	19	97.8	10.5	15.9	6.5	50	14.3	4.8	40				28.4	14.7	35				78.3	6.2	83.0	5.9
Plastering	6	96.5	5.4	13.3	4.5	35	13.5	4.2	40				23.3	21.1	30				74.8	7.5	80.0	5.6
Plumbing	14	95.6	13.3	13.7	7.0	40	14.7	6.1	45				37.1	17.8	50				76.8	5.8	84.2	5.8
Sheet Metal	6	98.8	19.8	19.8	11.7	65	15.0	7.5	45				49.6	24.8	65				77.3	5.9	85.8	4.1
Woodworking	23	95.4	10.7	13.5	3.4	40	10.9	4.6	30	24.1	8.1	45	37.6	18.4	50	21.0		15	75.8	4.5	86.8	4.2
Elect. Gen.	103	102.8	11.7	14.0	6.1	40							40.7	21.2	55	36.9	12.5	55	76.8	6.6	81.7	4.1
Elect. Rad.	31	111.3	11.2	18.4	5.7	55							50.8	18.8	65	40.7	8.8	65	84.0	4.6	86.0	3.7
Elect. Ind.	19	100.4	10.3	12.3	4.8	25							41.2	18.6	55	35.9	9.1	50	80.2	6.7	85.2	5.2
Foods,Bak'g	4	89.5	14.0							14.0	8.1	20							72.5	6.0	80.5	4.4
Foods,Quant	4	85.5	5.0	10.0	2.8	20	10.0		25	4.0	2.8	10	7.0	7.1	40				68.2	9.2	79.8	4.6
Machinist	90	98.6	12.0	12.9	5.2	35	13.8	5.6	40	18.7	9.5	25	34.9	20.1	45	36.6	8.6	55	76.2	6.0	79.5	6.5
Welding	8	93.6	9.6	10.7	2.5	20	9.0	1.0	20	8.5	3.5	10	37.0	16.2	50	34.0		45	73.9	4.3	80.9	5.8
Tool Design	7	99.4	12.6	15.6	5.3	45	13.6	4.6	40	18.0	13.8	25	29.0	16.7	40	33.0		40	79.3	4.5	81.3	7.6
Mech., Auto	64	100.1	13.5				14.4	8.3	40	21.5	9.2	35	33.6	21.5	45	34.9	11.4	50	74.7	7.5	82.2	5.7
Mech.,Aviat.	40	100.3	10.6							22.5	10.6	35	39.3	20.2	50	34.1	12.7	45	78.2	6.1	79.9	5.1
Mech.,Marine	5	103.8	12.9										55.6	17.7	75	46.2	13.0	80	75.6	7.7	84.8	5.0
Printing	19	102.4	13.2										30.4	20.6	40	31.5	9.1	40	78.2	4.8	83.7	3.7

[a]Form A, Grade 9 Norms

Table 9

Average Ability Scores and Standard Deviations
For 9th Grade Trade Groups

		I.Q.		D. A. T.														Acad. Aver.		Shop Aver.	
				Verb. Reas.			Num. Abil.			Abs. Reas.			Space Relat.			Mech. Reas.						
Trade	N	X	S	X	S	%ile[a]	X	S	%ile[a]	X	S	%ile[a]	X	S	%ile[a]	X	S	%ile[a]	X	S	X	S
Building	69	99.1	11.7	13.0	7.0	35	16.4	7.3	50	24.2	10.7	45	35.6	21.5	45	27.6	12.3	30	75.8	8.3	81.0	9.3
Elec., Gen.	170	105.3	10.1	19.4	6.9	65	20.1	6.6	65	39.0		50				38.1	10.2	55	73.3	7.9	75.4	8.5
Foods, Bak'g	13	97.0	10.6	9.0	5.5	15	14.1	3.5	40	18.5	10.0	25	32.2		40	26.7	10.7	25	71.8	5.2	76.9	5.1
Foods, Quan.	24	97.4	11.5	14.0	4.9	40	12.6	5.9	35	23.5	9.4	40	32.2	18.1	40	27.9	16.2	30	72.9	5.8	75.2	9.1
Machinist	124	97.8	11.2	13.8	6.0	35	15.9	7.4	50	22.4	11.4	35	31.4	17.4	40	31.2	11.4	35	73.0	9.3	75.8	10.2
Tool Design	9	101.0	12.3	13.3	4.5	30	10.2	5.0	25	27.9	6.3	55	34.5	21.7	45	26.0		25	72.1	11.6	74.8	10.3
Mech., Auto	145	97.2	11.9	15.9	5.6	50	17.3	6.2	55	25.8	10.1	50				32.8	11.2	40	70.5	9.7	73.2	8.2
Mech., Aviat.	73	99.7	10.0	17.7	5.7	60	16.9	5.9	55	28.2	8.9	55				32.4	10.3	40	73.9	8.3	70.7	9.1

[a]Form A, Grade 9 Norms

such schools as a kind of "dumping ground" for the academically weak. It is true, of course, that the academic averages of these boys fall consistently below their shop averages. Grading standards here are undoubtedly very different. It should be noted, nevertheless, that practically all of these academic averages are 75 or better (with the sole exception of the small food group). The DAT results are approximately what one would expect: lower percentile ratings for the more "academic" subtests and higher percentiles on Space Relations and Mechanical Reasoning. (All of these percentiles are read from Grade 9 norms.) Where data are available, student performance on Abstract Reasoning is typically very poor. These trends check nicely with other vocational high school data (Doppelt, et al., 1959).

Data for the 9th graders show more uniform trends. Again the IQ ratings hover around the population mean of 100. Here the typical DAT percentiles are "higher" in the sense that most cluster around the 50th percentile level. This checks reasonably well with the rather sparse vocational high school Grade 9 data provided in the DAT Manual (Bennett, et al., 1959). Looking at these Grade 9 percentile equivalents, the 12th graders look distinctly weaker; some of the better academic prospects leave the vocational high schools prior to reaching the 12th grade (note that the Verbal and Numerical DAT scores for Grade 12 are lower than those for Grade 9). The Grade 9 boys perform approximately equally as well in their academic as they do in the shop courses; at the Grade 12 level, there was a sharp differentiation.

Comparing the more uniform trends for the Grade 9 data against the more differentiated Grade 12 data suggests that abilities have some

influence on success, or persistence, in vocational high school programs. Space perception and mechanical reasoning appear more important for the electrical and mechanical trade curricula than for the building, printing

Measured Interests at Different Levels of Ability

Clark (1961 p 89) presents data, based on the achievement records of naval personnel in Aviation Machinist training, which suggests that when learning ability is just adequate (i.e., at the average level), the motivational aspects of interests may then play an important role in school achievement. In his Table 35 he notes that the highest correlation between school grades and interest scores occurs with General Classification Test scores of 60-62; above and below this narrow range, the size of the correlations drops radically.

We tried to check this with our 12th grade vocational high school boys. Here we separated the curriculum groups into "high," "average" and "low" in terms of the aptitude test data. "High" was arbitrarily defined as IQs of 110 and above, "average" as 91-109 and "low" as 90 and below. For the DAT subtests (as Verbal, Spatial, Mechanical) "high" was set at the 80%ile or above for Form A (9th grade norms), "low" for the bottom 20 percent, "average" in the middle range of 21-79%ile. Academic and shop course school averages were defined as: "high" of 85 and above, "low" as 69 and below, with the "average" range as 70-84. We then calculated the average MVII standard scores on only the criterion scales for these different ability groups as defined either by IQ or a particular DAT subtest or their school average. There were adequate data only for 12th grade students

in the Electrical or Radio/TV program. None of the psychological test data (IQ or DAT subtests) produced differences for MVII criterion scale scores. Students in the top or "high" academic and shop averages earn higher MVII criterion scale scores than do students falling below these vocational high school grade standards. The data are not complete but, at least with this one curricular group, it is the able students, whether measured by aptitude test standards or by actual school achievement, that earn the higher MVII scores on the criterion scales.

Suggested Revision of MVII for Secondary School Groups

Clark (1961, p 19) mentions the fact that some difficulties have arisen with the inventory because of vocabulary level. He further states that, if the inventory were to be rewritten, a vocabulary level of a lower order would be utilized. From our experience with these vocational high school boys, both at the 9th and 12th grade levels, we would heartily concur with this suggestion. There are far to many "advanced" technical terms employed in the inventory; much administration time was spent in explaining to the boys the meanings of such terms (examples: smear, chef, synthetic, sociology, personnel, comptometer). When publishing plans are finally agreed upon, it would therefore be wise to develop both an adult and a student form, the latter geared to a vocabulary level considerably reduced from the present one.

A reduced version of the MVII in another sense would also be helpful for this proposed student form. The inventory in its present form is too long for use with young boys, especially as early as Grade 9. Most of the boys needed more than one hour to complete the task; when even small amounts of time are added to this, because of

additional biographical data collection, one easily runs into an 1½ or 2 hour testing session. With smaller groups, and utilizing class time, two administration sessions might be planned and with more reliable results. Another suggestion would be to revise the inventory by eliminating the items and scoring keys for specialties not usually found in either academic or vocational high schools. Suggested eliminations might be the scales for Milk Wagon Driver, Warehouseman, Truck Driver, Hospital Attendant.

ABSTRACT and SUMMARY

The study is, essentially, a concurrent validity check on the Minnesota Vocational Interest Inventory, an empirically derived, forced-choice inventory measuring interests for some twenty sub-professional or skilled tradegroups (bakers, carpenters, electricians, printers, radio/TV repairmen, sheet metal workers, etc.). It was developed by Dr. Kenneth E. Clark whose recently published book (1961) discusses the early work and the application of the MVII both to civilian and U. S. Navy samples. Other than this published work of Clark, most research with the MVII is still not available in print. Copies of the MVII itself were kindly made available to us by Dr. Clark along with permission to duplicate. The inventory is eventually to be published by the Psychological Corporation in New York City. Scoring of the interest keys is translated into standard score form where 40 is the mean for Tradesman-in-General on any key and 60 is the mean of the criterion group.

Other studies, using the Kuder and the like, involving vocational high school students have generally produced inconclusive results. The relevance of many of the MVII scoring keys to vocational school curricula is immediately apparent.

The research design called for testing over 1000 boys in the 9th and 12th grades of four Buffalo, New York, vocational high schools. Major training programs in these schools were building, electrical, food service, machinist, mechanical and printing trades. For most of these programs, there were matching MVII scoring keys available. In

addition to all 20 MVII scores obtained for each boy, school records provided data regarding general intelligence level (typically, Lorge-Thorndike IQs from the 8th grade level) and scores on five of the DAT subtests. Average grades for academic and shop courses were also computed both for the 9th and 12th grade samples. (The authors also have plans for retesting of the Grade 9 boys when they reach Grade 12, contemplated for 1965.)

Usable MVII scores were obtained for 1,114 boys at Grades 9 and 12. There are slightly more of the former than the latter (58% versus 42%.) Almost 10% of the sample were Negroes which also allowed the authors to check for possible ethnic differences. All the boys were urban residents of Buffalo. By their own description, most fathers were employed in skilled and semi-skilled occupations; over one-third of the boys indicated the mothers worked outside the home. Grade 9 boys were tested in January, 1962; 12th graders in the Spring of 1962, just prior to graduation.

The IBM 1620 Computer provided major assistance in describing and analyzing the data. Since many of the MVII raw scores were negative (the Clark scoring keys have both positive and negative score weights), a constant of 50 was added to each score to keep it within the bounds of 01 and 99.

Comparisons of mean MVII scores for Grade 9 versus Grade 12 and for Negro versus white produced few significant differences. The Grade 9 boys and the Negroes showed somewhat higher clerical and personal service interests than do either the Grade 12 boys or whites.

Two-thirds of the Negro sample, however, are 9th graders. The differences in MVII scores are greater between the two grade levels than between the two ethnic groups.

Significant differences were obtained between 9th and 12th graders on the aptitude and achievement measures but not for the general intelligence test. Scholastic aptitude test results suggest the more intellectually able students leave the vocational high schools; the spatial and mechanical test results suggest the more technically skilled students remain. The Negro subjects showed lower average scores than whites on all the ability measures save one (the DAT Abstract Reasoning), a test frequently regarded as lacking "academic" content.

Profiles of average MVII scores were obtained separately for each trade program at each grade level. Scores were transformed to agree with Clark's adult civilian norms (mean of 40 for TIG and mean of 60 for the criterion group). A student who scored 60, say, on the Electrician scale would indicate this score falls at the mean of the criterion group.

At the Grade 12 level, the food, electrical and printing trades produce the most valid profiles. The student food groups, though small at both grade levels, turn up with highest scores on the Baker and Food Service Manager scales. The electrical students average moderately high scores on both the Electrician and Radio/TV Repairman keys, the two criterion scales in this instance. The single printing trade group of students stands out for its many low

MVII scores; the group scores moderately high (close to the criterion score of 60) on the relevant Pressman and Printer scales, but elevated scores also appear for such non-technical scales as Baker, IBM Operator, Stock Clerk. Guidance uses, then, at the Grade 12 level are limited mostly to these three groups of students. For students in other curriculum such as building trades or machinists or mechanics, the situation is otherwise; here the inventory misses since students in these programs frequently earn highest MVII scores on non-criterion scales.

Similar results, although with fewer "hits", were found for the Grade 9 students. Most of the scores are hovering around the TIG score of 40 which would suggest the trade interests of these students are not yet well differentiated.

Concurrent validity data were checked in a second way by comparing the proportions of boys within a given trade curriculum scoring high on MVII scales closely relevant to that particular trade against proportions of boys outside this school program (example: MVII profile data for boys in electrical programs versus all non-electrical boys). Here we lowered our definition of "high" score to that of 55 rather than 60. Results from these analyses, both at the Grade 9 and 12 level, are not very different from results obtained from merely the average MVII scores per curriculum group. Again we find that the MVII is somewhat more valid with seniors than freshmen and best results occur for food, electrical and printing student trade groups.

Measured ability levels for different trade groups, at both

grade levels, were analyzed. Average IQs for both grades range closely around the population mean of 100. The electrical trade boys constitute a rather "elite" group with above-average scores on all ability measures. The food trade group (although very small numerically) have the lowest scores. Most average grades in academic areas are 75 or better, shop averages tend to be higher.

Two suggested changes for the MVII, to make it more adaptable for secondary school use, were made: (a) to eliminate many of the technical words so that the vocabulary level for the entire inventory would be lowered; (b) to cut down on the number of items and scoring keys by eliminating such keys that do not coincide with the usual vocational school curricula.

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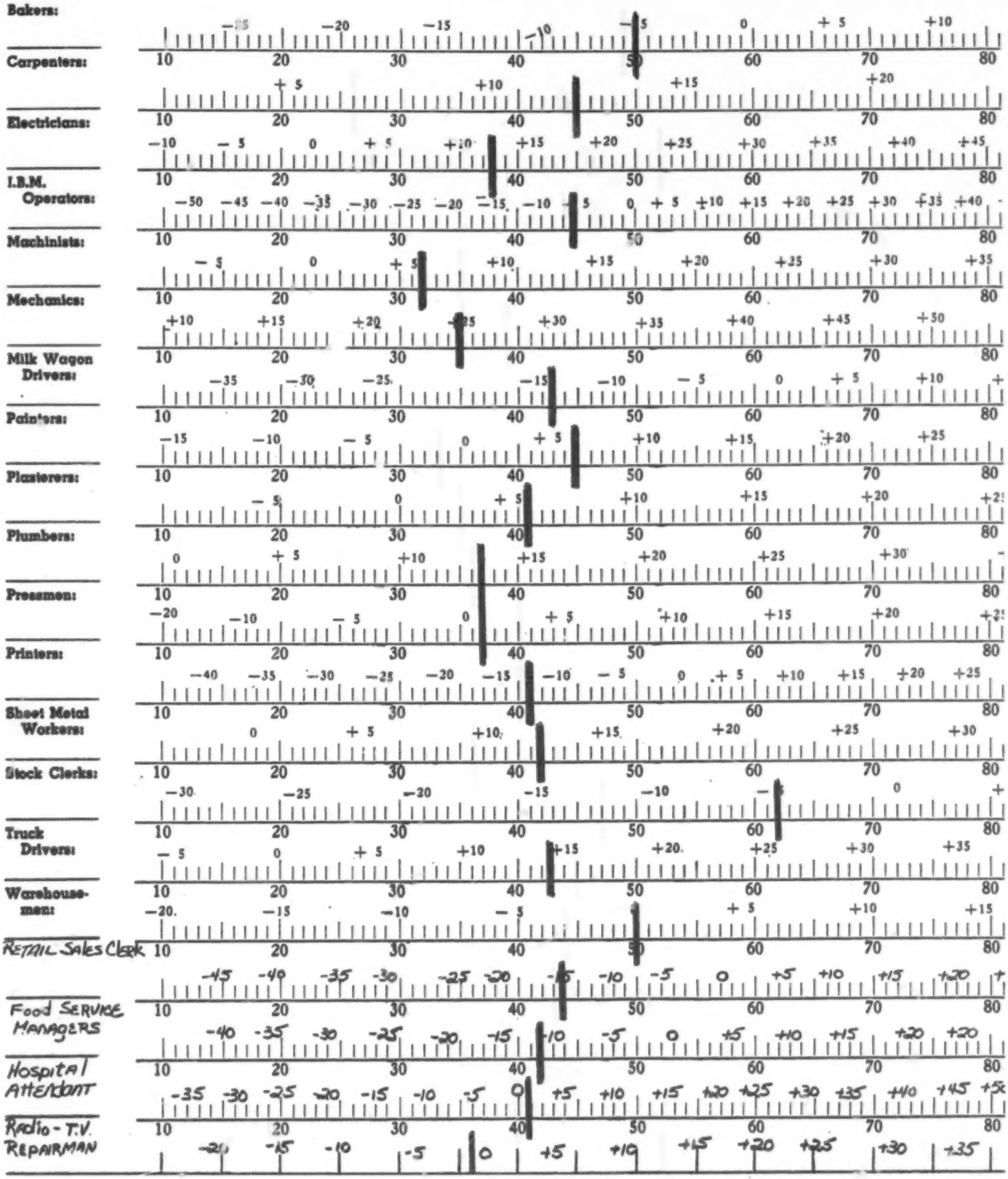
APPENDIX

Profile of Mean Scores of 12th Grade Building Trades

On Occupational Keys of the Minnesota Vocational Interest Inventory

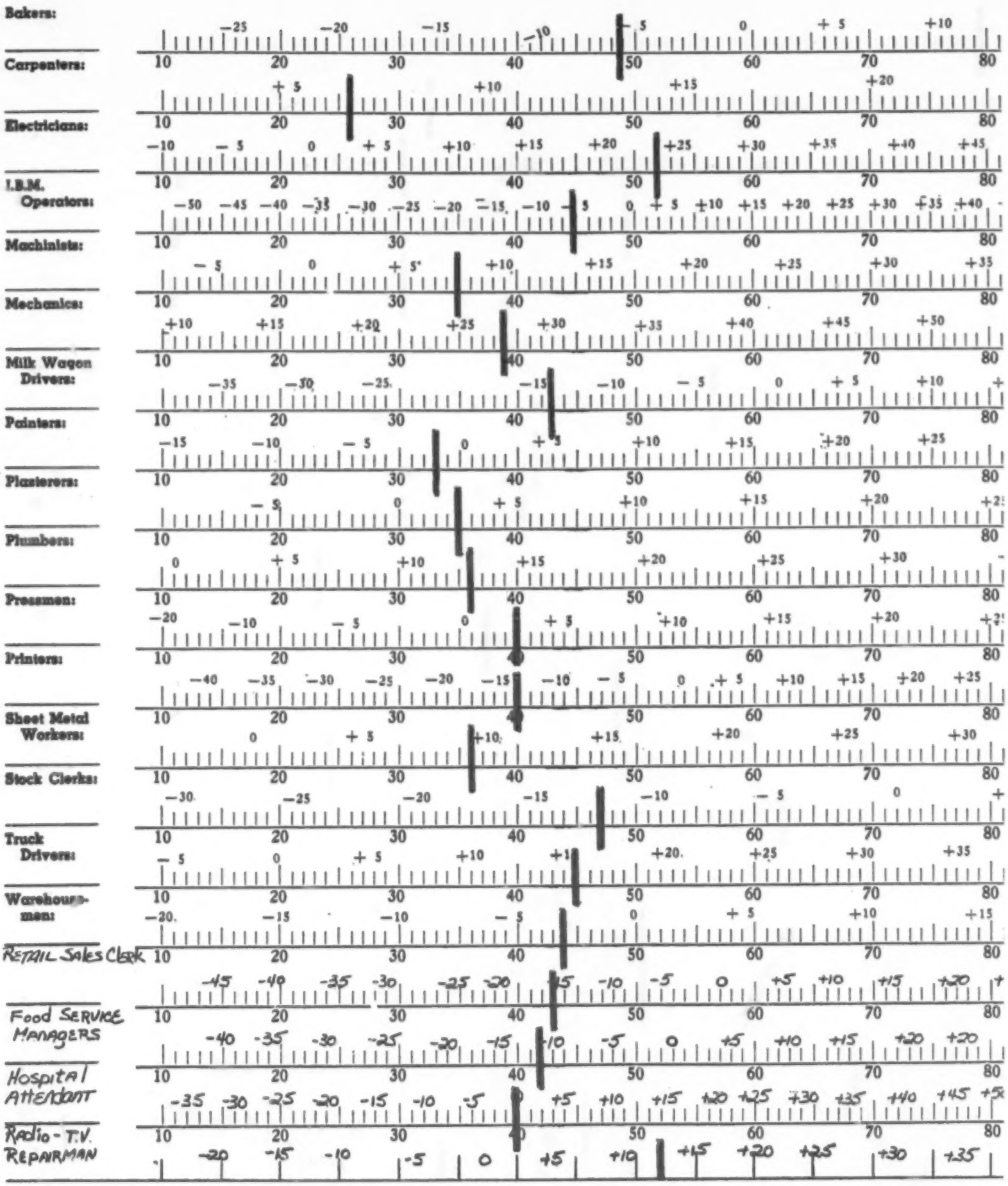
B. CIVILIAN KEYS



Profile of Mean Scores of 12th Grade Electrical Trades

On Occupational Keys of the Minnesota Vocational Interest Inventory

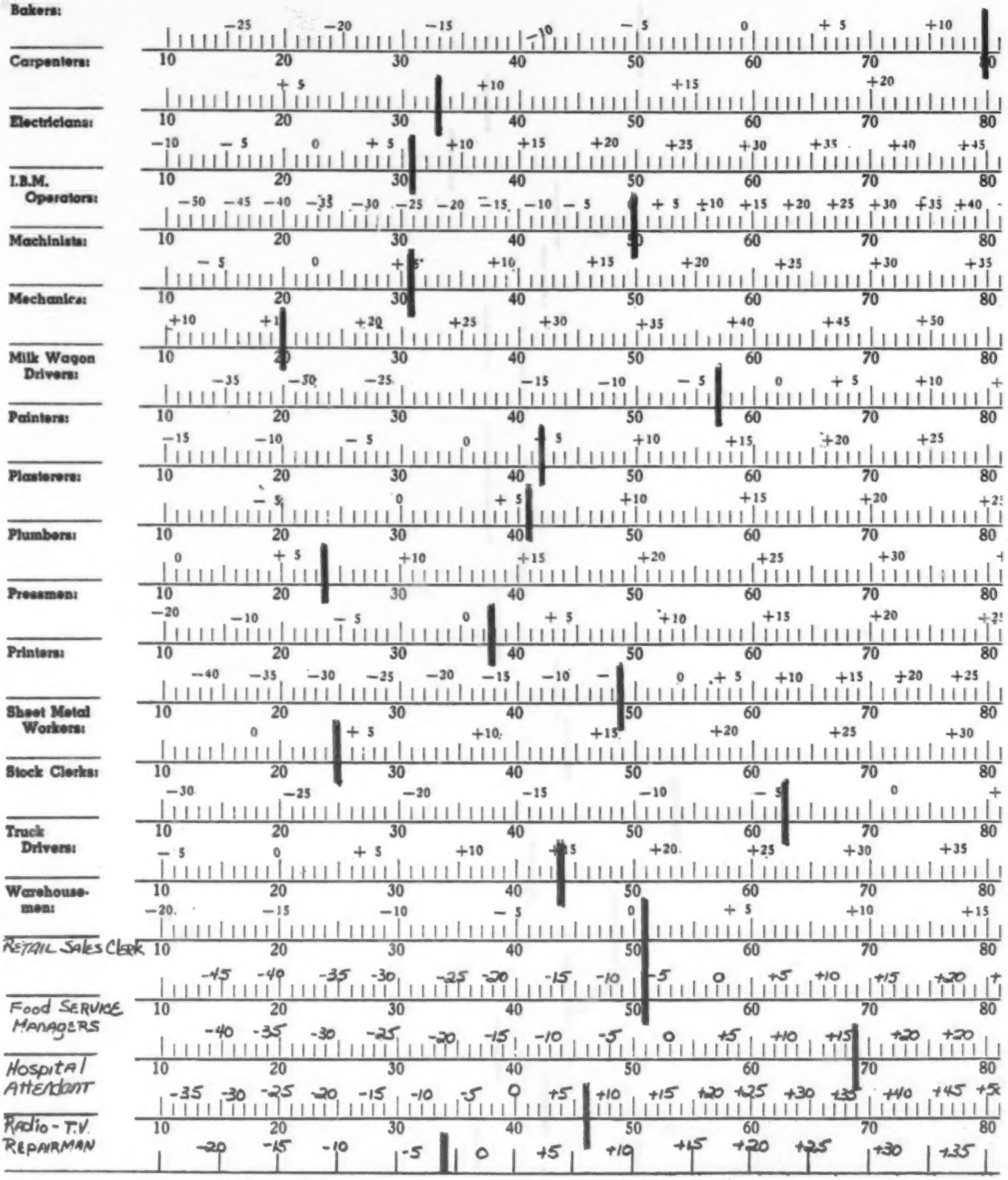
B. CIVILIAN KEYS



Profile of Mean Scores of 12th Grade Food Trades

On Occupational Keys of the Minnesota Vocational Interest Inventory

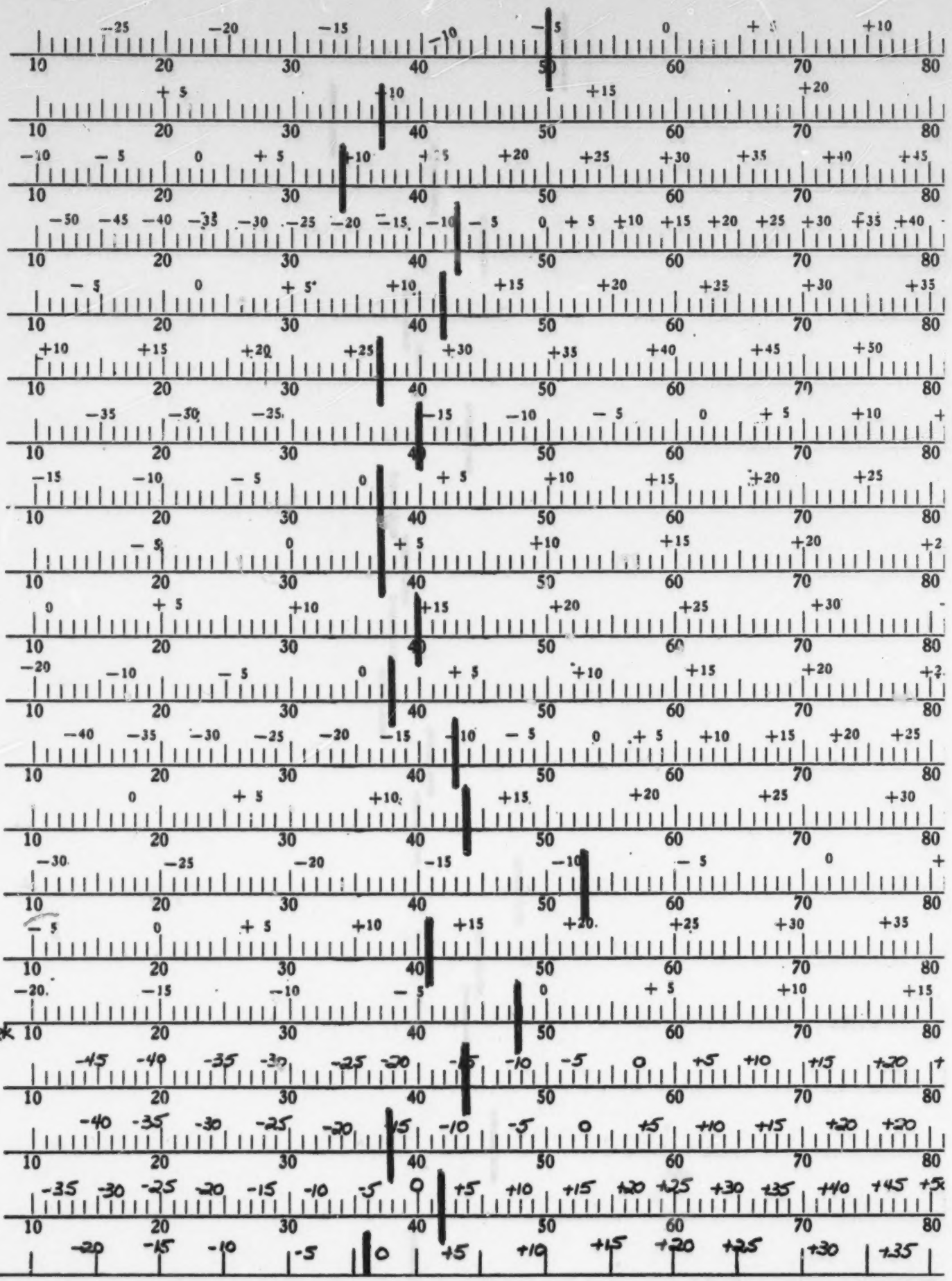
B. CIVILIAN KEYS



Profile of Mean Scores of 12th Grade Machinist Trades

On Occupational Keys of the Minnesota Vocational Interest Inventory

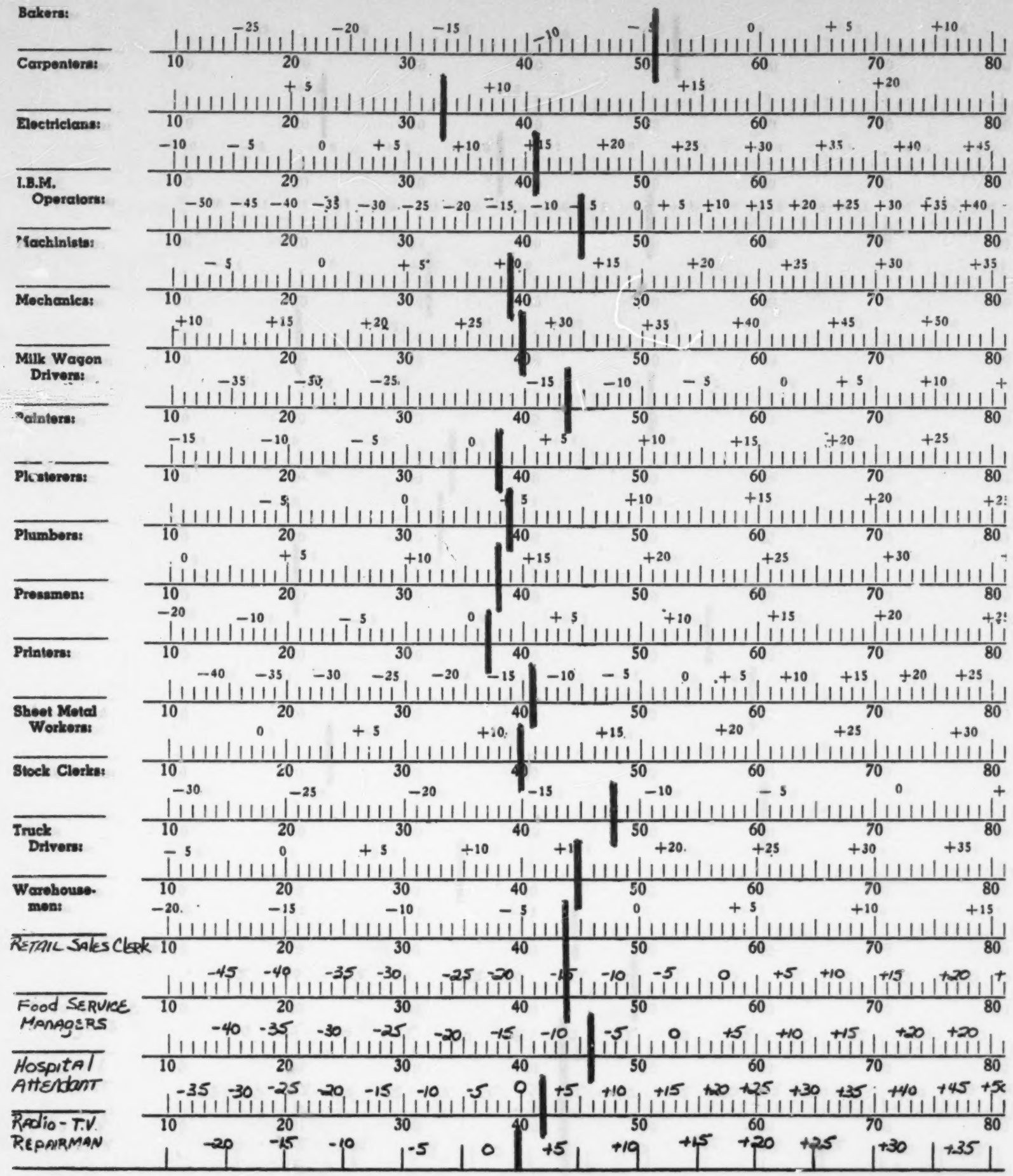
B. CIVILIAN KEYS



Profile of Mean Scores of 12th Grade Mechanical

On Occupational Keys of the Minnesota Vocational Interest Inventory

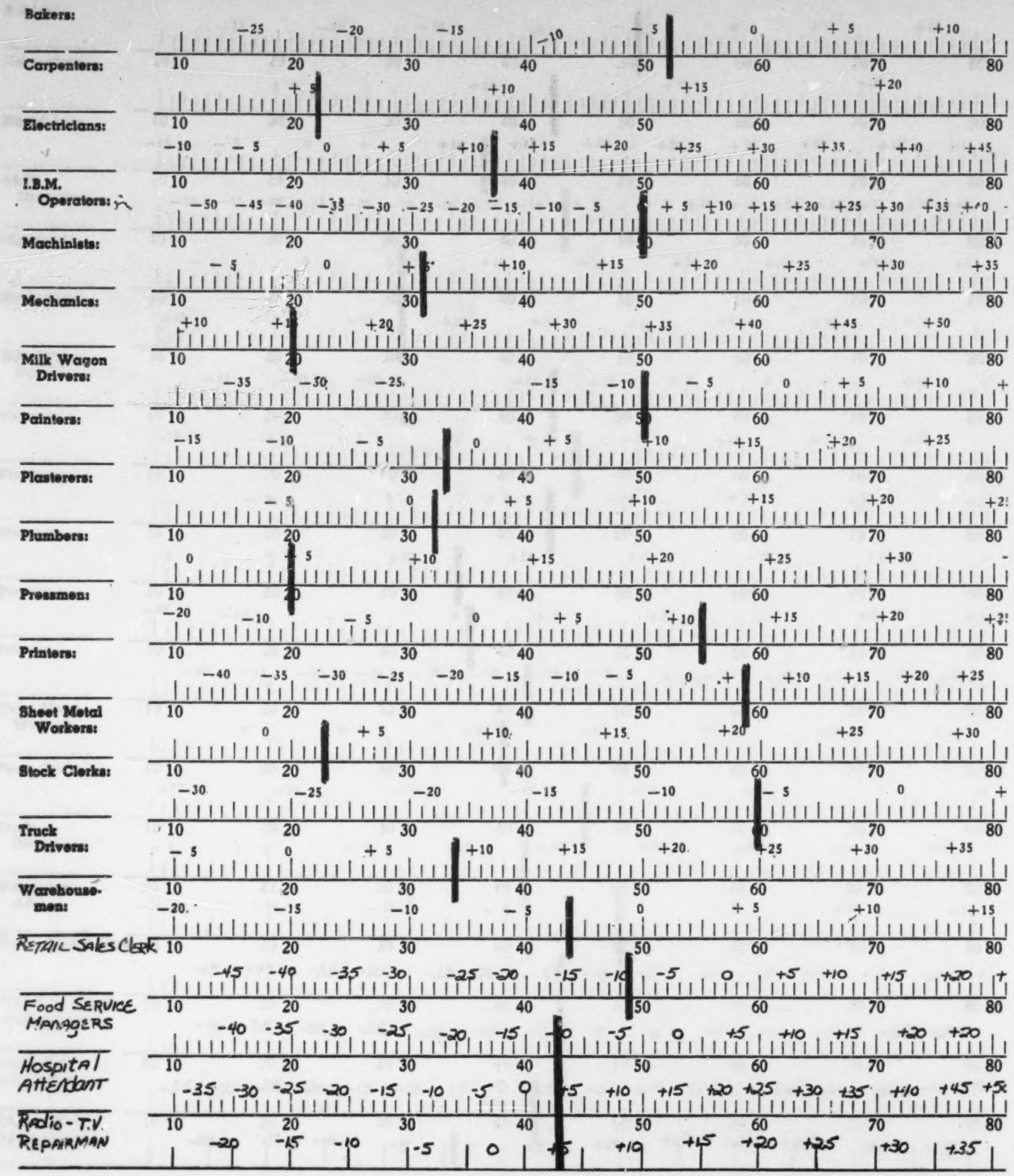
B. CIVILIAN KEYS



Profile of Mean Scores of 12th Grade Printing

On Occupational Keys of the Minnesota Vocational Interest Inventory

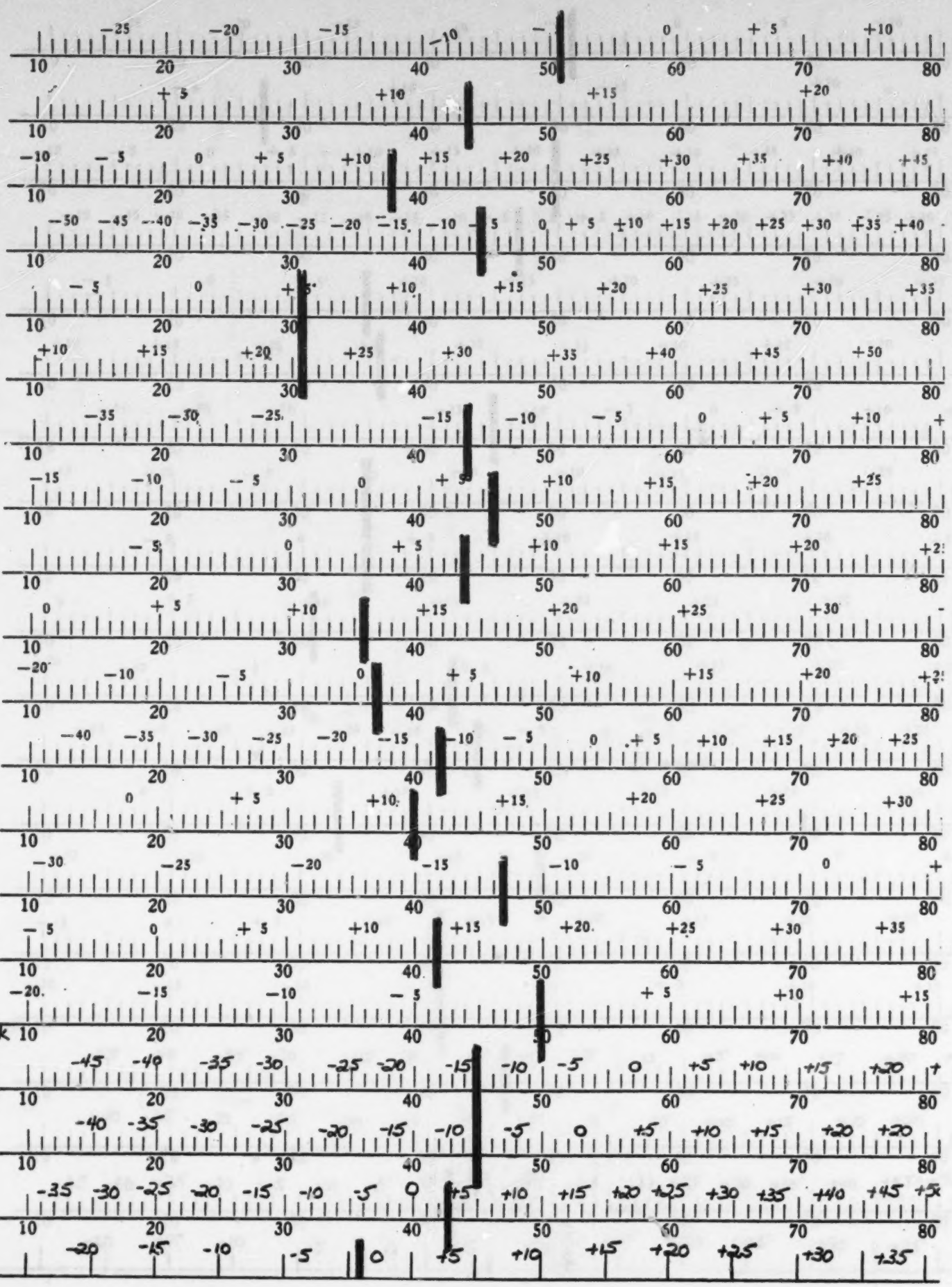
B. CIVILIAN KEYS



Profile of Mean Scores of 9th Grade Building Trades

On Occupational Keys of the Minnesota Vocational Interest Inventory

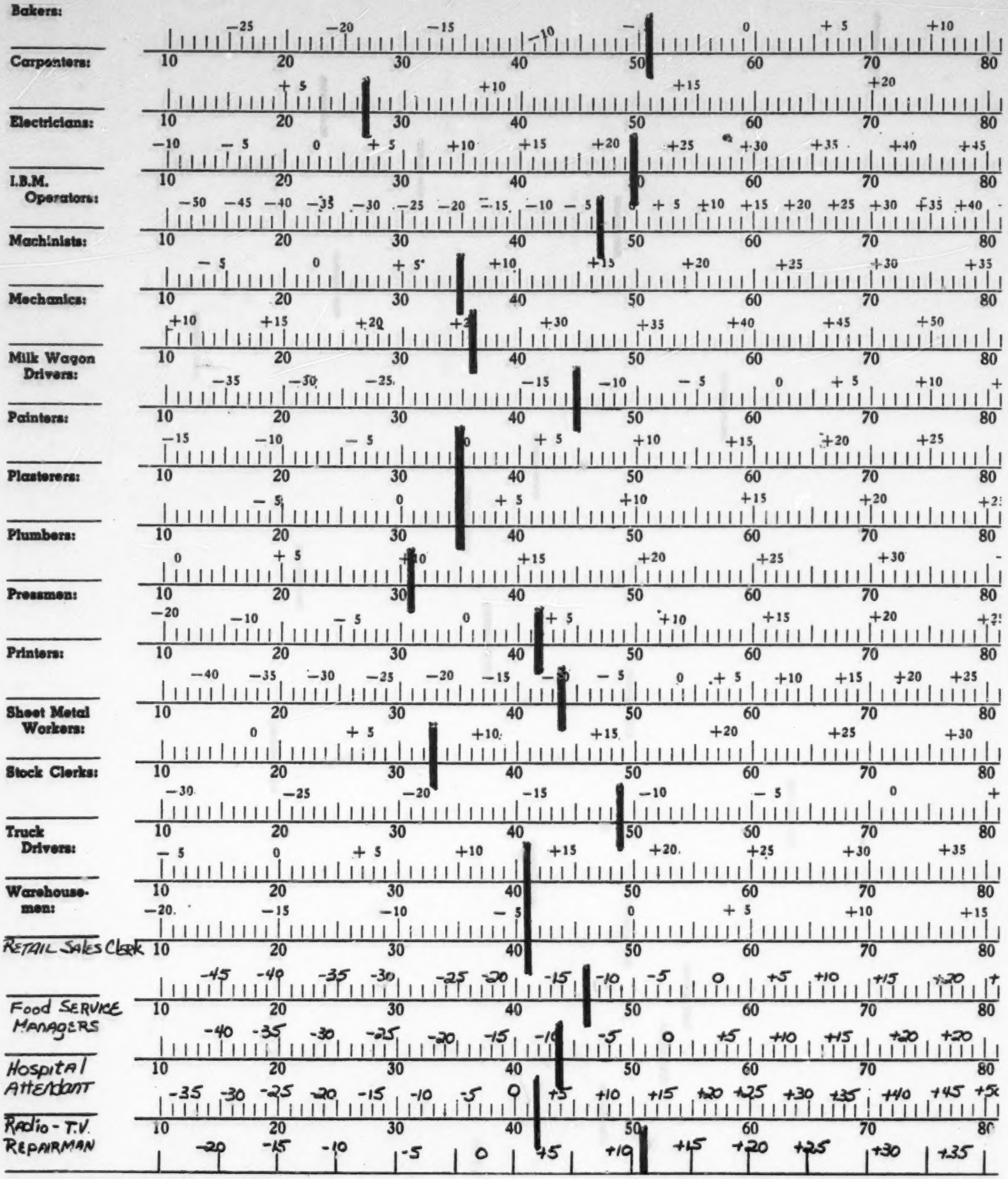
B. CIVILIAN KEYS



Profile of Mean Scores of 9th Grade Electrical Trades

On Occupational Keys of the Minnesota Vocational Interest Inventory

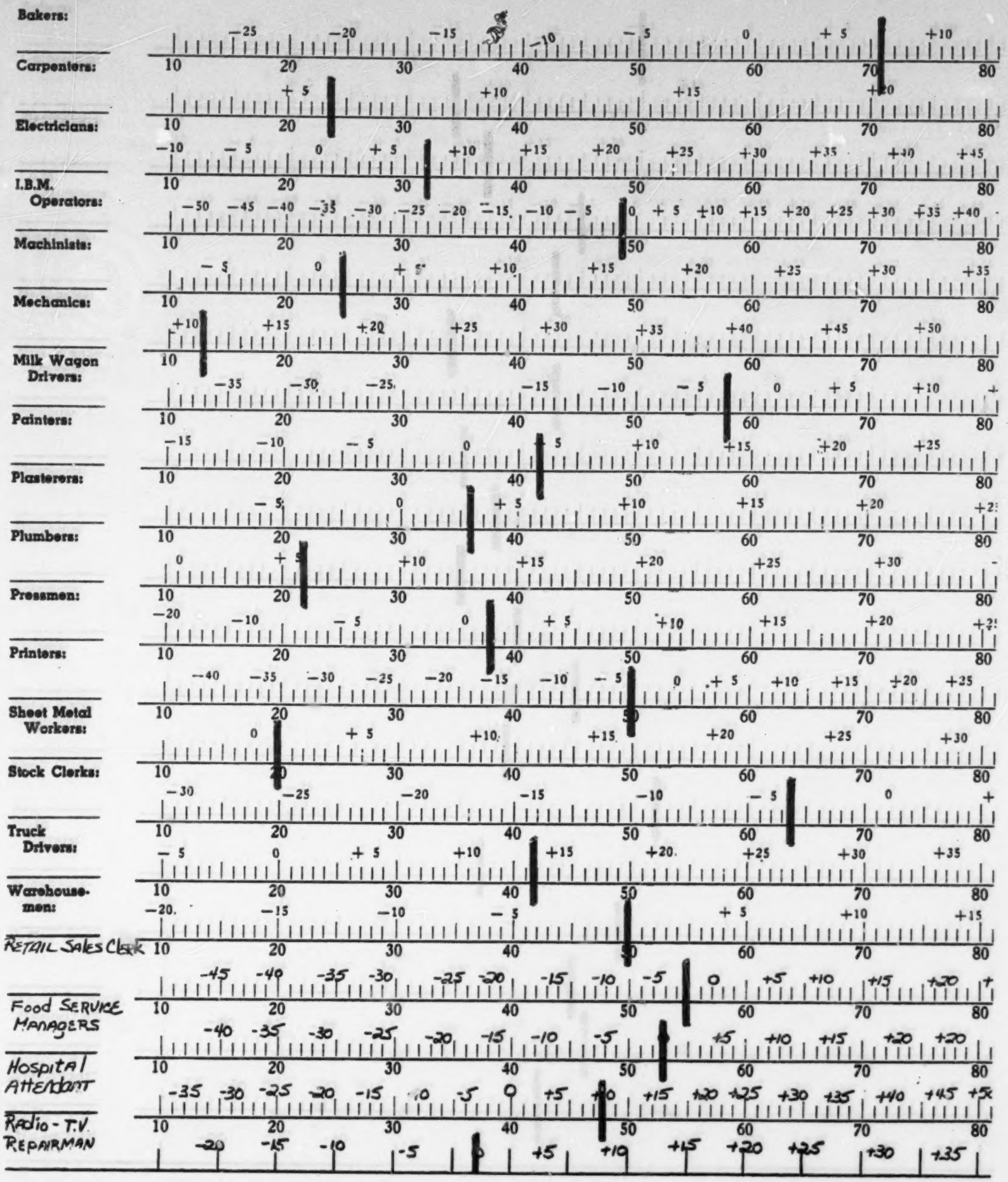
B. CIVILIAN KEYS



Profile of Mean Scores of 9th Grade Food Trades

On Occupational Keys of the Minnesota Vocational Interest Inventory

B. CIVILIAN KEYS



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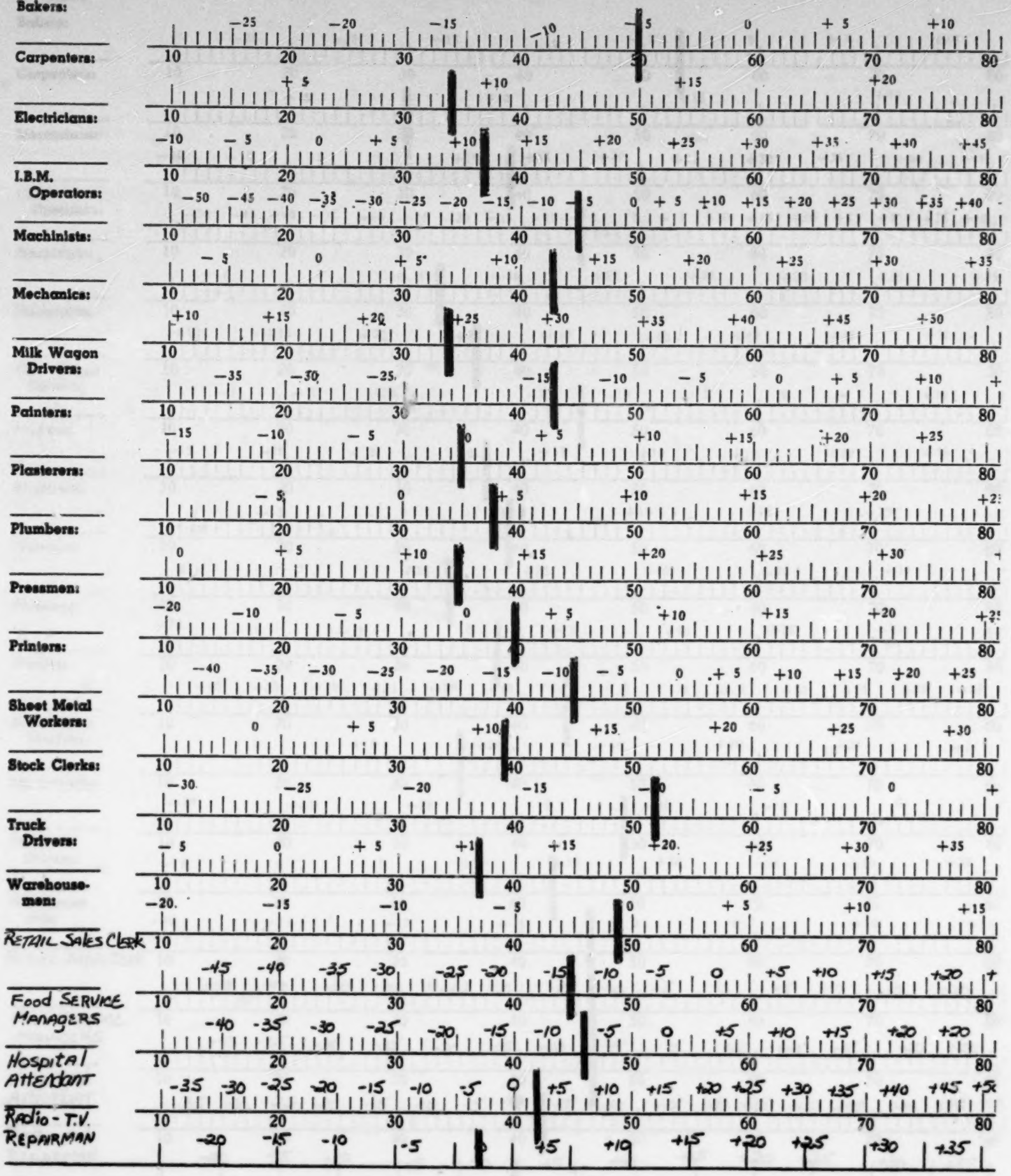
Profile of Mean Scores of 9th Grade Machinist Trades

On Occupational Keys of the Minnesota Vocational Interest Inventory

B. CIVILIAN KEYS



Profile of Mean Scores of 9th Grade Mechanical

On Occupational Keys of the Minnesota Vocational Interest Inventory

B. CIVILIAN KEYS